DOCUMENT RESUME

ED 239 596 IR 010 958

AUTHOR	Gilbert, Dennis; And Others
TITLE	Microcomputers: A Review of Federal Agency Experiences, Computer Science and Technology.
INSTITUTION	National Bureau of Standards (DOC), Washington, D.C. Inst. for Computer Sciences and Technology.
REPORT NO	NBS-SP-500-102
PUB DATE	Jun 83
NOTE	150p.
AVAILABLE FROM	Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.
PUB TYPE	Reports - Research/Technical (143) -- Tests/Evaluation Instruments (160)
EDRS PRICE	MF01/PC06 Plus Postage.
DESCRIPTORS	Attitudes; *Computer Programs; *Federal Government; Interviews; *Microcomputers; *Policy Formation; *Public Agencies; Questionnaires; Selection; State Government; *Use Studies
IDENTIFIERS	Electronic Bulletin Boards; New York

ABSTRACT

The results of a study conducted during the period August 1982 to January 1983, this overview of federal agency experiences with microcomputers represents a synthesis of information gathered from interviews with staff of one state and 12 federal agencies, informal discussions, and examination of the available literature, agency documents, and technical publications. Discussions of microcomputer issues identified by the study focus on organizational attitude and approach to microcomputers, agency policy, support activities, acquisition, personnel, application requirements and software, operating systems, and hardware. The interview questionnaire, summaries of the agency interviews, and a summary tabulation of agency questionnaires are included. The concluding section consists of some general observations, remarks on trends, and examples of agency microcomputer activities. Fifty references and suggested readings are listed. Appendices include a list of agency contacts, microcomputer information sources, an annotated bibliography of agency documents, ICST (Institute for Computer Sciences and Technology) Micro Electronic BBS (Bulletin Board System) access instructions, and completed survey questionnaires. (LMM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED239596

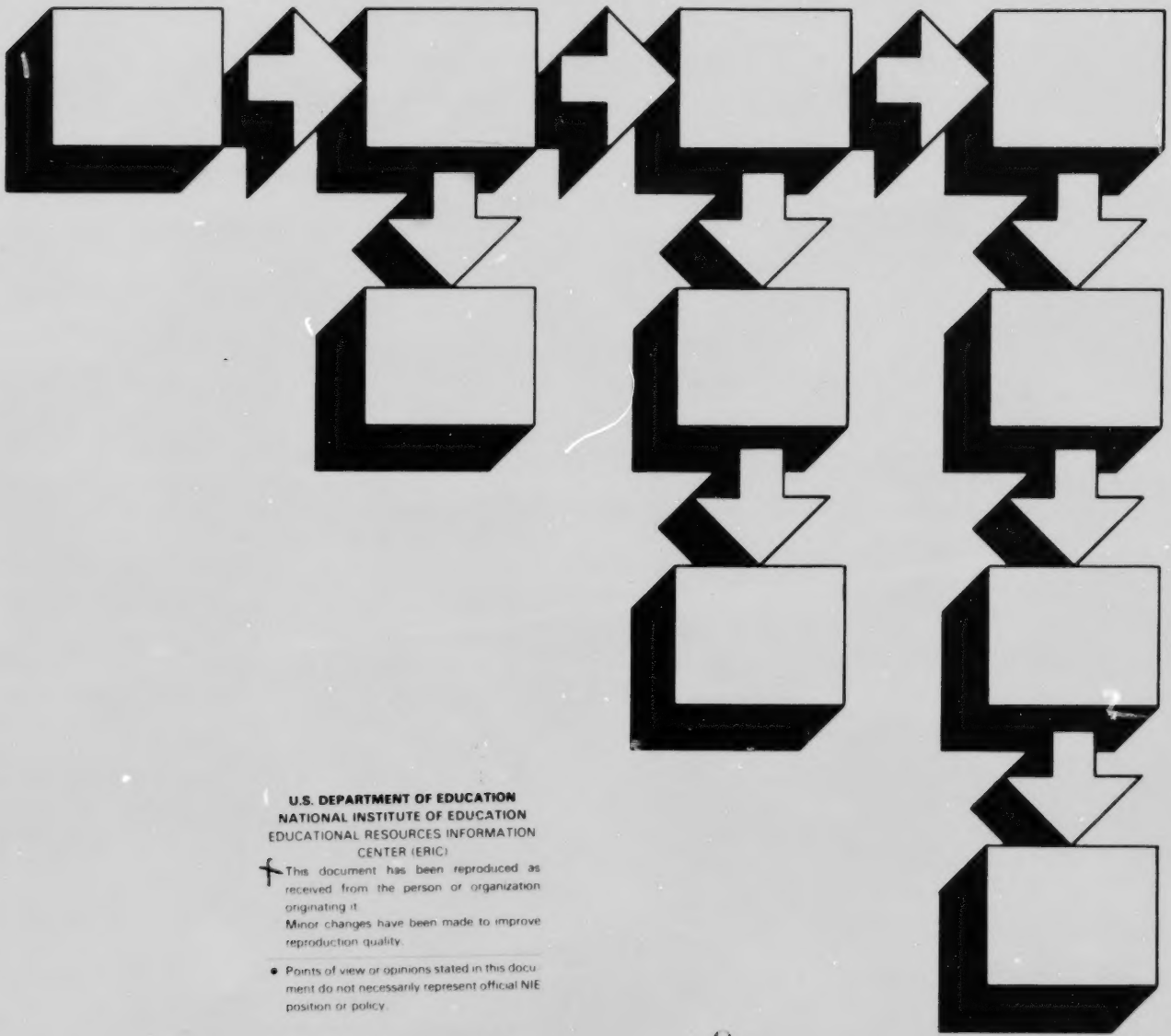
U.S. Department
of Commerce

National Bureau
of Standards

Computer Science and Technology

NBS Special Publication 500-102

Microcomputers: A Review of Federal Agency Experiences



U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

LR010958

NATIONAL BUREAU OF STANDARDS

The National Bureau of Standards[1] was established by an act of Congress on March 3, 1901. The Bureau's overall goal is to strengthen and advance the Nation's science and technology and facilitate their effective application for public benefit. To this end, the Bureau conducts research and provides: (1) a basis for the Nation's physical measurement system, (2) scientific and technological services for industry and government, (3) a technical basis for equity in trade, and (4) technical services to promote public safety. The Bureau's technical work is performed by the National Measurement Laboratory, the National Engineering Laboratory, and the Institute for Computer Sciences and Technology.

THE NATIONAL MEASUREMENT LABORATORY provides the national system of physical and chemical and materials measurement; coordinates the system with measurement systems of other nations and furnishes essential services leading to accurate and uniform physical and chemical measurement throughout the Nation's scientific community, industry, and commerce; conducts materials research leading to improved methods of measurement, standards, and data on the properties of materials needed by industry, commerce, educational institutions, and Government; provides advisory and research services to other Government agencies; develops, produces, and distributes Standard Reference Materials; and provides calibration services. The Laboratory consists of the following centers:

Absolute Physical Quantities[2] — Radiation Research — Chemical Physics — Analytical Chemistry — Materials Science

THE NATIONAL ENGINEERING LABORATORY provides technology and technical services to the public and private sectors to address national needs and to solve national problems; conducts research in engineering and applied science in support of these efforts; builds and maintains competence in the necessary disciplines required to carry out this research and technical service; develops engineering data and measurement capabilities; provides engineering measurement traceability services; develops test methods and proposes engineering standards and code changes; develops and proposes new engineering practices; and develops and improves mechanisms to transfer results of its research to the ultimate user. The Laboratory consists of the following centers:

Applied Mathematics — Electronics and Electrical Engineering[2] — Manufacturing Engineering — Building Technology — Fire Research — Chemical Engineering[2]

THE INSTITUTE FOR COMPUTER SCIENCES AND TECHNOLOGY conducts research and provides scientific and technical services to aid Federal agencies in the selection, acquisition, application, and use of computer technology to improve effectiveness and economy in Government operations in accordance with Public Law 89-306 (40 U.S.C. 759), relevant Executive Orders, and other directives; carries out this mission by managing the Federal Information Processing Standards Program, developing Federal ADP standards guidelines, and managing Federal participation in ADP voluntary standardization activities; provides scientific and technological advisory services and assistance to Federal agencies; and provides the technical foundation for computer-related policies of the Federal Government. The Institute consists of the following centers:

Programming Science and Technology — Computer Systems Engineering.

[1]Headquarters and Laboratories at Gaithersburg, MD, unless otherwise noted; mailing address Washington, DC 20234.
[2]Some divisions within the center are located at Boulder, CO 80303.

Computer Science and Technology

NBS Special Publication 500-102

Microcomputers: A Review of Federal Agency Experiences

Dennis Gilbert
Elizabeth Parker
Lynne Rosenthal

Institute for Computer Sciences and Technology
National Bureau of Standards
Washington, DC 20234

TK10958

U.S. DEPARTMENT OF COMMERCE
Malcolm Baldrige, Secretary

National Bureau of Standards
Ernest Ambler, Director

Issued June 1983

Reports on Computer Science and Technology

The National Bureau of Standards has a special responsibility within the Federal Government for computer science and technology activities. The programs of the NBS Institute for Computer Sciences and Technology are designed to provide ADP standards, guidelines, and technical advisory services to improve the effectiveness of computer utilization in the Federal sector, and to perform appropriate research and development efforts as foundation for such activities and programs. This publication series will report these NBS efforts to the Federal computer community as well as to interested specialists in the academic and private sectors. Those wishing to receive notices of publications in this series should complete and return the form at the end of this publication.

National Bureau of Standards Special Publication 500-102
Natl. Bur. Stand. (U.S.), Spec. Publ. 500-102, 146 pages (June 1983)
CODEN: XNBSAV

Library of Congress Catalog Card Number: 83-600545

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON 1983

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402
Price
(Add 25 percent for other than U.S. mailing)

TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY	1
1. INTRODUCTION	4
1.1 Background	4
1.2 Purpose	5
1.3 Scope	5
1.4 Audience for this Document	5
1.5 Methodology for the Study	5
1.6 A Caveat	6
1.7 Overview of Document	6
1.8 Sources of Information	6
1.9 Disclaimer	8
2. MICROCOMPUTER MANAGEMENT ISSUES	9
2.1 Organizational Attitude and Approach to Microcomputers	9
2.1.1 Need for an Organizational Approach	9
2.1.2 Role and Focus of Microcomputers	10
2.1.3 Pace of Introduction of Microcomputers	12
2.1.4 Types of Management and Vehicles for Management	13
2.2 Agency Policy	14
2.3 Support Activities	16
2.4 Acquisition	17
2.5 Personnel	20
3. MICROCOMPUTER TECHNICAL CONSIDERATIONS	23
3.1 Application Requirements	23
3.1.1 Communications	23
3.1.2 Resource Sharing	23
3.1.3 Security	24
3.1.4 Reliability and Availability	24
3.2 Application Software	25
3.2.1 Purchased or Custom Software	25
3.2.2 Programming Languages	25
3.2.3 System Requirements	26
3.2.4 Application Integration	26
3.2.5 Documentation and Training	27
3.3 Operating Systems	27
3.3.1 System Configuration	27
3.3.2 Software	28
3.3.3 Transportability	28
3.3.4 Utilities	28

TABLE OF CONTENTS

Page

3.4 Hardware 28
3.4.1 Basic System 28
3.4.2 Microprocessors 29
3.4.3 Storage 29
3.4.4 Other Peripherals 29
3.4.5 Maintenance 30

4. SUMMARIES OF FEDERAL AGENCY EXPERIENCES 31

4.1 Sample Questionaire 32
4.2 Summaries of Agency Interviews 34
4.3 Summary Tabulation of Agency Questionnaires 50
4.4 Tabulation of Agency Provided Support 52

5. CONCLUSION 53
5.1 Observations 53
5.2 Trends 54
5.3 Examples of Agency Microcomputer Activities 54

6. ACKNOWLEDGEMENTS 56

REFERENCES AND SUGGESTED READINGS 57

APPENDICES

A: Agency Contacts
B: Microcomputer Information Sources
C: Listing of Agency Documents
D: ICST Micro Electronic BBS Access Instructions
E: Completed Questionaires

EXECUTIVE SUMMARY

1. INTRODUCTION

In recent years we have seen striking advances in the cost/performance of microcomputer-related technology, an explosion of interest in small computers, and a proliferation of computing technology and resources. These developments are contributing to the accessibility of computing power that was once the sole province of large general purpose mainframes and minicomputers. New capabilities are being sought by and provided to end users. New emphasis on the role of end user computing in the organization is forcing rethinking of many questions about information processing in the organization and about the acquisition, management, and utilization of the new technology. The Federal information manager is challenged with effectively using the new technology to achieve near-term productivity objectives, without inhibiting innovation and creativity.

This document presents the results of a recent study which reviewed Federal agency experience with microcomputers. Its intended audience includes all those who are interested in microcomputer-based technology and want to benefit from current Federal experience. This document is a "snapshot" taken during the period of August, 1982 - January, 1983. It is not intended to be in-depth, comprehensive, or statistically valid. We feel, however, that the picture that emerges is sufficiently representative to be of value.

The results presented in this document represent a synthesis of the information gathered from the interviews and from other available sources of information (including informal discussions and an examination of available literature, agency documents, and technical publications). While some details about particular agencies may no longer be appropriate, we feel that the underlying issues, questions, considerations, concerns, and lessons learned are still valid and will continue to be so in the near future.

The appendices of this document provide the reader with preliminary sources of information about microcomputers. To facilitate the exchange of information, an electronic bulletin board, the ICST Microcomputer Electronic Information Exchange, (Telephone: (301) 948-5718), has recently been established. This facility, covering microcomputer-related subjects, is available to anyone who has the appropriate dial-up terminal capabilities.

2. MICROCOMPUTER MANAGEMENT ISSUES

The study identified a number of areas that were receiving increasing attention by agency management staffs. The areas that are discussed relate to the acquisition, operation, and management of microcomputers. The discussions include the considerations, decisions, and actions that need to be explored in order to: a) exercise management control while capturing the potential of the technology; b) establish applicable policy and guidance; c) determine appropriate support activities and effective ways to provide that support; d) facilitate the use of the technology, in a way so as to minimize disruption and to enable an orderly transition to the changed environment; and e) determine the skills required to effectively manage and utilize the new information technology.

3. MICROCOMPUTER TECHNICAL CONSIDERATIONS

The technical considerations identified in the study include: a) the application requirements that need to be specified for existing and/or future systems to account for the capabilities of communications, resource sharing, security, and reliability/availability; b) the method by which application software should be obtained (off-the-shelf vs custom software), and the characteristics of programming languages, system configuration, application integration, and documentation and training that are required; c) the significant factors, in selecting an operating system, that need to be considered with regard to: system configuration, application software, transportability, and utilities; and d) the features of hardware that are significant to users in selecting and maintaining a system.

4. INTERVIEWS WITH FEDERAL AGENCIES

The results of the interviews conducted with Federal agencies include: the questionnaire used in the interview process; summaries of each interview session; a tabulation of the summarized responses; and a tabulation of the support functions currently being provided by agencies to their end users. Detailed agency responses are presented in Appendix E.

5. CONCLUSIONS

In general, we observed an excitement generated by the microcomputers and we noticed a growing number of individuals interested in learning about and becoming users of the systems. Agencies, in response, are exploring and developing policies and structures to provide guidance and support to their end users. Conversations with users and providers of support services indicate that the models which are effective for managing microcomputers are

those which promote responsive, centralized services to those who find it to their advantage to use the services and conform to agency standards and guidance. Such incentive-based support appeared to be a major tool available to agencies for the management of the new technology.

The major applications currently are word processing, spread sheet,and data base management. The software is predominately single function, off-the-shelf packages. New systems are evolving that incorporate more powerful hardware and software, and combine the functionality of the older systems with graphics and networking in new and creative ways which present a more integrated environment to the user.

The variety, power, and sophistication of the hardware and software continues to advance. While the sophistication of users and the market place is also advancing, there is a corresponding need to share information, with an increasing emphasis on applications and technologies that address resource and data sharing. Although little has so far been accomplished, the trend points to the increasing integration of microcomputer systems into the total information management schemes of Federal agencies.

1. INTRODUCTION

1.1 Background

Over the past few years the trickle of interest in small computers has grown to flood proportions. We are experiencing an unprecedented proliferation of computing technology and resources; we are seeing the rapid invasion of many aspects of our work, home, and leisure environments. Advances in semiconductor and related technologies are making available computing power that was once the sole province of large general purpose mainframes and minicomputers. The end user now has immediate access to and control of substantial computing power.

We are now, with growing frequency, made aware that something exciting is happening. The media not only mirror the rapidly increasing interest in microcomputers in our society, they also fuel and accelerate the process. Time Magazine, in its January 3, 1983 edition, chose the computer for its Man of the Year. The amount and breadth of media coverage, and other evidence, reinforce our intuitive notions that fundamental changes are taking place. These activities suggest we are at a frontier that is rapidly changing as we observe and experience it. New and appealing opportunities and promises are implied - decreased drudgery, increased productivity, more emphasis on creativity, new ways to learn, new ways to communicate, improved ways to deliver products and services, new ways to plan, new ways to spend our leisure time.

And yet, despite the lure and excitement, Federal information managers and others are increasingly aware that the traditional tools (e.g., analytical techniques, methodologies, literature) have not been adequately applied to the new technology. They have neither had the personal and organizational experiences nor developed the necessary understandings to comprehend fully the implications of the changes taking place. They are frustrated by the gap between the potential and the wherewithal to make it a reality. They are becoming increasingly aware of the need to reexamine basic concepts of data processing and information management. New emphasis on the role of end user computing in the organization and the growing availability of substantial, individual computing power is forcing rethinking of questions about the organization's attitude toward the new technology, how information and resources are to be distributed, how the new resources are to be acquired and managed, and the relationship of the new technology to traditional data processing.

The task facing the Federal information manager is to identify resources, to develop policies, and to create an environment which promotes effective use of the new technology and which simultaneously rewards, rather than inhibits, innovation and creativity. Federal policies and regulations were developed in an era in which mainframe orientation predominated. They must either be modified or implemented in ways which take cognizance of differing needs and environments. It is ironic (and fortunate) that the new technologies may be not only the source of the challenge, but also the source of the solutions for dealing with them.

1.2 Purpose

The purpose of this document is to present the results of a recent study which reviewed Federal agency experience with microcomputers. It is intended that by better understanding what other Federal agencies are experiencing and planning and what management issues and technical considerations are being addressed, the reader will be in a better position to make more informed decisions among the viable options available. It is additionally intended that this document contribute to raising the general level of microcomputer awareness and literacy. By identifying other sources of information and contact points it is hoped that the network of Federal information managers, end users, and others concerned with understanding the new technologies will be expanded.

1.3 Scope

This document is a "snapshot" of the current (August, 1982 - January, 1983) levels of awareness, management, policy, and use of microcomputers in a few Federal agencies. It is not intended to be in-depth or comprehensive or statistically valid. While it is extremely difficult to determine with certainty the extent of computer activity within any given agency, or what is happening throughout the Federal Government, we feel that the picture that emerges from this study is sufficiently representative to be of value to its audience.

1.4 Audience for this Document

The intended audience for this document includes all those who are interested in microcomputer-based technology and want to benefit from the current Federal experience. These include those who: a) determine agency microcomputer policy, b) specify requirements, c) evaluate, select, and procure microcomputers, d) use microcomputers, e) manage large numbers of users of microcomputers, f) expect to manage and to use microcomputers. While the focus of this document is toward the Federal community, it should also be of value to those of the private sector and academic communities who are dealing or wish to deal with microcomputers.

1.5 Methodology for the Study

The methodology for this study consisted primarily of interviewing representatives of a limited number of Federal Government agencies on their policies and experiences with microcomputers. Prospective interviewees were identified by word-of-mouth, through professional meeting contacts, and by reference from other interviewees. The interviews were conducted by Institute for Computer Sciences and Technology (ICST) staff with the assistance of the Federal Computer Performance and Evaluation Center (FEDSIM). To facilitate and focus the interviews, a questionnaire was developed that covered basic data and issues to be addressed. Additionally, the questionnaire was used as a point of departure and the discussions took the form of a free interchange of information and perspectives. A copy of the questionnaire can be found in Section 4.1. In addition to the formal interviews, many informal discussions were held with

numerous people, both in and out of Government - end users, information managers, policy makers, ADP professionals, consultants, industry representatives, publications personnel, information utility providers, and vendors. Further, information was gathered from Federal and agency policy documents, available professional and popular periodicals, information services (including bibliographic retrieval, electronic bulletin boards, and other electronic discussion groups), commercially prepared technology studies and forecasts, vendor literature, and personal experience with home and business microcomputer systems. The results presented in this document represent a synthesis of the information gathered from these sources.

It should be noted that while the interviewees were knowledgeable and shared much microcomputer-related information about their organizations, they were not speaking as official spokespersons for their agencies. References in this document to "agencies" and their activities, policies, opinions, and feelings should be viewed in that context.

1.6 A Caveat

To use this document appropriately, it is necessary to understand that many aspects of the environment are changing very quickly. The microcomputer marketplace, the types of products and the pace at which they are announced and made available (not necessarily synonymous), the costs of systems, and the level of user and agency awareness and activity are undergoing rapid transformations. As a result, some details about particular agencies may no longer be appropriate, and care must be exercised in interpreting the snapshot taken of a dynamic environment. We feel, however, that the underlying issues, questions, considerations, concerns, and lessons learned in this study are still valid - and will continue to be in the near future.

1.7 Overview of Document

The remainder of this document presents the results of our look at current Federal agency experience with microcomputers and of related information gathering efforts. In order to help the reader focus on relevant concerns, the next two sections address specific management issues and technical considerations, respectively. Composite agency profiles/summaries are presented in Section 4. Observations and recommendations are made in Section 5. The appendices contain valuable pointers to other sources of information.

1.8 Sources of Information

Technology is changing rapidly and useful technical information frequently experiences a rapid rate of decay. Many sources of information exist, but the person seeking such information is often overloaded with data, but starved for information that is useful. The task at hand is one of understanding what current sources of information exist and how to tap into them - and how to interact with others who have similar problems and solutions. In this context, we would especially like to draw attention to the appendices of this document which we feel can provide the reader with an initial road map

to sources of information about microcomputers and the new and emerging technologies. This is only an initial effort at gathering this information together. It is our intention to maintain current data on these and related resources. We extend an invitation to you to share with us sources that have been of value to you and/or that you would like to see included. As appropriate we will update this electronic bulletin board of information and information sources and make it available.

To obtain updated and additional sources of information, participate in direct discussion, ask or answer questions, and/or network with others who have related interests you may use the:

ICST Microcomputer Electronic Information Exchange
Telephone: (301) 948-5718

This recently established electronic bulletin board on microcomputer-related subjects is available to government and non-government persons who have the appropriate dial-up terminal capabilities. (See Appendix D for access instructions). In addition to providing bulletins on items of particular or timely interest, the information exchange will provide for one-to-one and one-to-many communication; leaving and reading of messages; and up- and down-loading of public domain software and files (as available). No pre-established passwords or user ID's are required.

The System Selection and Evaluation (SS&E) Group has responsibility for providing guidance to agencies in making informed choices among the available alternatives to manage, operate, and acquire information resources. Microcomputers and related new technologies play a large role in its programs. Among its activities, the group operates, for ICST, the Microcomputer Laboratory. This facility, which houses a variety of popular and newly released hardware and software, provides the opportunity to investigate and compose experience-based assessments of commercially available offerings by ICST and other government agencies. For further information about the Microcomputer Laboratory, the Microcomputer Electronic Information Exchange, and ICST's microcomputer-related activities and services, contact the System Selection and Evaluation Group by means of the Information Exchange or at the following address.

System Selection and Evaluation Group
National Bureau of Standards
B266 Technology Building
Washington, DC 20234
Telephone: (301) 921-3485

1.9 Disclaimer

Because of the nature of this report, it is necessary to mention vendors and commercial products. The presence or absence of a particular trade name product does not imply criticism or endorsement by the National Bureau of Standards, nor does it imply that the products identified are necessarily the best available for the purpose.

2.0 MICROCOMPUTER MANAGEMENT ISSUES

A number of management issues came out of our study. These have been subjectively grouped into major areas covering: Organizational Attitude and Approach to Microcomputers, Agency Policy, Support Structures, Acquisition, and Personnel. The issues and concerns identified and the related questions raised in each area are discussed below.

2.1 Organizational Attitude and Approach to Microcomputers

This section examines the issues and concerns regarding the agency's organizational attitude and approach to microcomputers.

2.1.1 Need for an Organizational Approach

Issue/Concern: Microcomputers can represent significant organizational resources and significant potential (for productivity, waste, and lost opportunity). There is a growing need to develop an organizational view and to manage the rapidly changing technology.

The interviewed agencies unanimously agreed that there is a growing awareness within their organizations that microcomputers are becoming powerful resources and can no longer be viewed as "toys" that will soon be discarded, but rather must be viewed as resources that must be taken seriously. They indicated that their organizations recognize potential opportunity, challenge, and problems. There is growing understanding that the costs of individual microcomputers and software packages are small; however, when multiples of microcomputers, hardware products, software packages, staff time and opportunity costs are considered, substantial "organizational" resources are using and being affected by microcomputers. There seemed to be general agreement that, in the long-term, effective management would require an organizational view and an organizational approach to the management of microcomputers. Such a view, they felt, was necessary to address major questions of concern related to:

a) planning for microcomputers
b) the pace of introduction of the new technology
c) the impact of the technology on the organization

However, few of the interviewed agencies had formulated a comprehensive "world view." Because the technology is advancing so rapidly, and because the infusion and proliferation of microcomputers is so recent, only a very few of the organizations interviewed had either sufficient time or resources to take the broad view required to understand and assess the technology and develop a scenario for the role it should play in their organizations. Some of those interviewed expressed the view that the "slowness" in forming such a "corporate" attitude was not necessarily a "bad thing." Rather, they saw it as an appropriate caution in an environment in which the technology, and an understanding of how to manage and use it, are still very immature. Unfortunately, the consequence of a (perhaps short-lived) lack of an "organizational" view (and policy) towards microcomputers is confusion for many concerned and leaves unclear such questions as how

microcomputers are to be acquired and how they are to be used. They saw its absence, along with the rapidity of change, as having contributed to frustration among some groups because of not being able to incorporate fully the technology into either their day- to-day operations or their long-range system planning.

In the process of discussing organizational perspective, those interviewed identified a number of related areas. These included: the role and focus of microcomputers, the pace of introduction of the new technology, and the type of management and vehicles for exercising it. Each of these areas is discussed below.

2.1.2 The Role and Focus of Microcomputers

Issue/Concern: What roles do microcomputers play and will they play? What is the appropriate role of microcomputers in the organization ?

The introduction of microcomputers has occurred for a variety of reasons in the various agencies. In the agencies interviewed there have been two major sources pushing microcomputers. One source has been the user population. This is especially true in environments where there is a highly technical or scientific base. In these situations, employees recognize that the microcomputers can be used for their own individual productivity and are either obtaining them directly or are making demands on their management and their data processing departments to provide them with the resources. For them, the microcomputer is very much an individual, personal work station with the employee finding little requirement for sharing beyond the self-contained unit. In many cases, the motivation comes because of personal experience with a home system or from exposure to the media. In some instances the employees either take work home or buy their own systems to bring into work as a means to make their jobs easier, and to increase their own productivity.

It was reported that some individuals saw microcomputers as ways of avoiding problems they've had with traditional data processing. These problems are typically associated with system availability and reliability, and the users saw microcomputers as not being affected by the main processor's down time. The microcomputers further provided a basic set of capabilities - word processing, spread sheet analysis, and data base management - that gives the end users an adequate set of capabilities which allows them to do work on their own without depending on data processing people and overloaded clerical support.

Microcomputers are seen as a way to do work at ones own speed, in ones own time frame, minimally restricted by outside constraints, and higher level approvals.

What the agency managers have told us, in effect, is that a number of their people have seen the capabilities of the microcomputer. They want to incorporate it into their way of doing work and have taken the initiative. The use of microcomputers is very much end user initiated and driven. Typically, end users, because they are using a tool in a productive, utilitarian way, are willing to

go through the related "pain" of learning. For the agencies' first wave of users, that's their orientation.

The next wave was typically inspired not by end users, but by their agency management or ADP shop who saw how microcomputers were being used and wanted their people to have them for some of the same applications. This group of users has a different motivation and different dynamics are involved. It is someone else - their management - that is making microcomputers available or relatively easy to obtain, and encouraging their use.

Why are microcomputers being used? The interviewed agencies are not making heavy use of application-specific software packages (i.e., general ledger, inventory control) but are using a subset of what is available. Programs are available in a variety of application areas, but the extent of use of these packages has not been determined. It appears from the interviews that the agencies (and to some extent, private industry) are making primary use of off-the-shelf, general purpose packages, such as word processing, data base management, spread sheet analysis, and graphics. Scientific communities are relying more heavily on languages than on packages. Whenever feasible, however, packages are selected which can be modified to meet their needs. An example of this use is a package called Modem 7, a communications package being modified and used by several of the interviewed agencies to interface microcomputers to mainframe computers.

Those interviewed indicated that even though there has not been a rush to use the application specific packages, a growing number and variety of software packages that address a wide range of application areas are becoming available. Some that show promise are areas of accounting and record keeping, training/education, energy conservation and management, engineering and scientific applications, management sciences, programming aids and systems development, project scheduling, product and service distribution, time and personal management, self improvement, and transportation management. Though the agencies are aware of these packages and see potential benefit in their use, they have not decided what their approach should be at this time. In a similar vein, the agencies indicated that they have made relatively little use of bibliographic retrieval or other utility information services available by means of their microcomputers and modems (even though their libraries may subscribe).

What do the agencies see as the role of the microcomputer within their organizations and how do they see that role impacting their organizations? The interviewed agencies have only made initial efforts at answering this question. Until recently, all processing and analysis was performed on the agencies' mainframe and minicomputer systems or by hand. Now, microcomputers allow many applications to be performed at lower costs than on mainframes and also allow applications that were never computerized in their organizations. The current focus of microcomputer use within the agencies was indicated to be as follows:

* to increase the agency's efficiency and effectiveness

* to increase clerical and end-user productivity
* as a managerial aid
* as communications media
* to distribute information
* as a gateway to external information sources

The impact of microcomputers on the agencies has not been determined so far. Some have suggested that microcomputers have not been used in enough ways and for a sufficient amount of time to make such a determination. The potential impact is considered to be far-reaching. The Department of Defense, (DOD), recognizing this potential, commissioned a continuing study on the Impacts of Low Cost Computing on the Department of Defense YOUN82 . The findings of this study, and other studies, may help information-hungry Federal agencies achieve a better understanding of the problem, in terms of (a) the types of support structures that are required (b) the potential impact on their organizations, and (c) the types of microcomputer policy that may be appropriate.

2.1.3 Pace of Introduction of Microcomputers

Issue/Concern: At what pace should microcomputers be introduced into the agency?

The extent to which the microcomputer technology is implemented and the pace at which the implementation is to proceed can reflect the agency's philosophy about: a) microcomputers, b) long range and short range goals, and c) management, ADP, and user orientations. The early introduction of microcomputers in most of the interviewed agencies was a result of user initiation. Currently, the users or the higher level management (typically ADP management) control the sequence and pace of the introduction of microcomputers in the agencies. Approximately half the agencies have users exerting the major influence on the sequence and pace of introduction. Regardless of who controlled the pace, several factors that influenced it within the interviewed agencies were:

* the degree to which current systems are satisfactorily meeting the agency/user needs.
* the degree to which the technology (hardware, software) meets the application requirements.
* the availability of knowledgeable personnel (users, ADP staff, etc.) to acquire, manage, or operate the microcomputer systems.
* the availability of funds for the purchase of a microcomputer system and any related expenses.
* the degree of integration and compatibility of the microcomputer with current information systems.
* the degree to which the technology fits into the agency's long and short range plans.

Although microcomputers are being introduced, for the most part, at either a fast or moderate pace in the interviewed agencies, we believe that most agencies (and private industry) are introducing microcomputers at a relatively slow pace. This difference, between what we observed and what we believe to be the situation, is due to our methodology for choosing the interviewed agencies, and discussions that we have had with several other Federal agencies. We chose to interview agencies which were actively exploring the microcomputer technology and related issues. The lack of knowledgeable staff and funding were the major reasons given for not introducing microcomputers faster. The application requirement was the single most important reason for the introduction of microcomputers. Agencies with scientific/technical users were the most aggressive, with management driven, administrative agencies following a more moderate or slower pace.

2.1.4 Types of Management and Vehicles for Management

Issue/concern: What is the appropriate degree of management and control of microcomputers and what are the vehicles for exercising that control, consistent with the organization's mission, personality, and resources.

The agencies interviewed were trying to find a middle ground in the spectrum of tight control (requiring justification and accountability on the individual unit level) and laissez-faire.

The use of microcomputers in many agencies began in very informal ways, with users and user departments acquiring microcomputer systems with little DP or MIS staff assistance, or sometimes even awareness. As a result, many agencies have no actual count of the number of microcomputers currently being used, nor do they have a good handle on the applications to which they're being applied. Other agencies, from the outset, controlled the acquisition of microcomputers. Generally, however, even in the latter case, there was rarely more than a supposition of numbers and applications.

Two types of situations appeared to lead to close tracking of agency use of microcomputers: a) those in which the microcomputers were being used for a very specific application; and b) those instances in which a high level of support was being provided to users. In the latter case, the users made their requirements and applications known to the support staff because the user was confident that improved service/support could be gotten in exchange.

All the interviewed agencies indicated that some degree of management and control was appropriate and necessary. They all voiced variations of the theme that, over the long term, control will:

a) help ensure that purchased equipment is compatible with other information systems with which the microcomputers will communicate

b) that microcomputers are being used effectively

c) that systems are capable of performing as required

d) that appropriate resource sharing is facilitated

e) that acquisitions are in accord with the agency's requirements for systems development and they can be integrated with the agency's long range information systems plans

Some conflict as to the need for management controls was expressed by a number of interviewees. One source of the conflict was the difficulty of achieving these benefits of control because of low individual unit costs, the distributed nature of the resources, the rate at which new products were being made available. Another source of conflict derives from the feeling that this is a time of much excitement and much to learn and much to experiment and innovate with. Concern was voiced that in the process of attempting to control microcomputers, the organization should not overly stifle or inhibit creativity -- just channel it productively.

There was general agreement that although some general principles were applicable, each organization was unique. It was therefore felt that the level and type of control should be determined by each individual agency and be consistent with the agency's organization, authorization policies, computing strategies, and type of support structures, and personnel and other resources. Additionally, a number of interviewees indicated that despite the immaturity and uncertainty of the microcomputer markets, it was not too soon for each organization to make explicit decisions on the way it will manage this new technology. It was felt that delay in acting could have potential cost and far-reaching implications for the agency. However, such action, they felt, needs to permit sufficient flexibility to allow for timely response to the inevitable and sudden shifts that would occur.

The interviews identified two main vehicles for managing microcomputers: a) the establishment of policy; and b) the establishment of support structures. These are discussed in sections 2.2 and 2.3.

2.2 Agency Policy

Issue/Concern: Should agencies establish formal policy and guidance with respect to microcomputer justification, acquisition, installation, and operation.

The dynamics of microcomputer technology and the proliferation of microcomputers throughout the Federal agencies has led to the need to develop microcomputer policies. Although policies are being developed, concern has been expressed as to the appropriateness of creating timely and comprehensive standards and/or guidelines for a technology which is changing rapidly and has many unexplored capabilities. (See [KAYP83] for a technological forecast).

The internal policies governing microcomputers have been the articulation, formalization, and implementation of the "organizational" attitude with respect to microcomputers. The agencies suggested several possible objectives for establishing microcomputer polices. These were:

* to define the role of the microcomputer within the agency's information management structure
* to set the framework for the systems to be supported
* to define the roles and responsibilities of managers, users, and support staff
* to define the potential microcomputer users, systems and/or applications
* to promote product flexibility and provide for future expandability
* to specify and ensure the integration of microcomputers with other information systems
* to protect the security and integrity of resources

The form of the policy (e.g. standards, guidelines, directives), the degree of enforcement, and the coverage were also factors for consideration. Since the policy specifications can impose a degree of constraint on the available microcomputer products, each agency had to balance these constraints with compatibility considerations as well as the depth and range of the functions it could support. Many policies were implicit practices and not explicitly stated in documents. Most agencies with written policies produced guidance documents rather than standards. For specific policy documents, see Appendix C: Agency Documents. The documents recommend hardware and software products and do not require a user to adhere to the guidelines. The development of "standards" documents has been limited. These documents require the user to conform to the hardware and software specified in the document. A waiver must be obtained for any deviation from the standard. The agencies recognize the volatility of the technology and plan to issue changes to the policy and guidelines as time and circumstances dictate.

The extent of coverage of the microcomputer policies varied with the policy objectives. The degree of policy coverage differed but included: acquisition, selection, management, and/or operation. Several agencies did not distinguish between microcomputers and other ADP equipment, and thus the same policies are used. However, because unit costs of microcomputers fall below the dollar theshold levels, several of the policy procedures for acquisition (e.g. justification and approval levels) are irrelevant and ignored for microcomputer acquisitions. Many of the microcomputer policies specify a minimum set of hardware, system and application software, and communication interface products. The use of existing and defacto standards were encouraged throughout the policies. In addition to the recommended

products, most policies included an explanation of the product selection and the reasons/rationale for its inclusion.

2.3 Support Activities

Issue/Concern: What support do end users require and what is the most effective way to provide that support?

Users are seeking guidance and assistance in the selection, evaluation, and operation of microcomputer hardware and software, and training in its use. The support functions requested range from volume purchase agreements, to consulting services for system selection; training and technical assistance in operation and implementation of the system; information exchanges such as newsletters, bulletin boards, or conferences; and in a few cases, custom written and supported software packages. We were told that many users have acquired their microcomputer systems with little or no assistance from the agency, but request or require assistance to extend the capabilities of the microcomputer beyond its original intended purpose (e.g., interface with the agency computers and data sources).

Agencies are concerned with providing support functions to assist their users. Most of the agencies we interviewed stressed the importance of providing assistance to the users, but do not wish to control the introduction or use of the microcomputers. Due to the variety of microcomputer systems in the agencies and the marketplace, agencies have designed incentive based support programs. Support functions are available for a limited set of hardware and software products. Users are encouraged to use these recommended products if support is desired. The support functions offered by the interviewed agencies varied. An Arthur Young study conducted for the Department of Defense [YOUN82] identified thirteen different microcomputer support activities:

* monitor technological trends
* develop microcomputer expertise in selected systems
* disseminate current technological information
* assist users in systems selection
* trouble-shoot during operations and maintenance
* evaluate hardware vendors
* evaluate software packages
* negotiate volume procurements
* design/deliver training
* build compatible micro/mini/maxi architecture
* establish a central demonstration room
* offer standard applications systems
* establish an information center

Several of the agencies interviewed provide a subset of these support activites. No agency is currently providing all of them. Section 4.4 contains a tabulated summary of the support functions and the levels of support currently being provided by the agencies. Nearly all the agencies are providing or plan to provide some degree of support.

Within the agencies, the support functions are being implemented by a centralized staff and/or by individuals who have been recognized as microcomputer experts. The reasons cited for implementing a centralized structure were:

* to eliminate duplication of effort.

* the economies of volume purchases.

* to promote efficient and effective methods for the exchange of information and resources.

* to enable transportability and compatibility of software and data.

* to be consistent with the agency's physical and organizational structure which is oriented for centralized support.

* to gather knowledge of organizational requirements for use in long range planning.

The most common support structure was a centralized microcomputer group composed of individuals with technical backgrounds in data processing and a particular interest in the emerging technology of microcomputers [YOUN82]. Several of the decentralized agencies have encouraged its subordinate agencies and field installations to establish a local, central support staff. A small number of agencies did not have any central support staff due to the organizational structure or a lack of money, staff, or work hours. In these agencies (this also occurred in agencies with a support staff), the only support available is from individual users who have emerged as microcomputer experts. These individuals, in addition to their assigned tasks, provide microcomputer advice and information. Often, the number of requests for information has been so great that the "expert" has not had the time to perform his/her assigned job.

2.4 Acquisition

Issue/Concern: How should systems (hardware/software) be acquired to facilitate use of the new technology in a way to minimize disruption and enable an orderly transition to the changed environment?

Acquisition is an issue because of the current environment in which the end users and their managers are buying microcomputers. This has not been the customary way to buy computers. The customary way is characterized by full systems staff involvement and control. Agencies acknowledge that their systems staff are frequently not involved in any aspect of the acquisition process, but systems staff insist that their involvement is necessary to prevent waste and to achieve the potential economies that come from buying microcomputers and utility software in quantity (i.e., lower unit costs on hardware and on software packages; single or central source for procurement and acquisition information; lower unit costs for maintenance, upgrades, and repairs). They say that higher level management

involvement is also necessary to insure that systems that are acquired are compatible with agency data processing systems with which the microcomputers may be required to communicate or to share resources or for which the agency may later be required to provide support.

Who should be involved in microcomputer acquisitions? The agencies agree that there is a role for all parties: a) end user, b) the user's management, c) the systems staff, and d) the agency policy management (IRM). They find that the process works best when each contributes in his/her area of expertise:

* the policy staff represents top management, knows the strategic goals, establishes and administers the agency's ADP policies.

* the systems staff is familiar with the technology and with agency computer resources; knows the issues and regulations related to acquisition, but the staff may be removed from the user's problem definition and unique computing requirements.

* the user's manager knows the problem and is aware of the budget and program priorities, but may be removed from the technology.

* the user knows the problem, but may know little about program priorities, regulations, policies, or long term goals.

The problem is that each may not be aware of the other's strengths and limitations, and the contributions that each can make to the process. Agency managers that we interviewed are concerned that unless the acquisition process is regulated and to some degree controlled, some of the problem areas usually associated with large mainframe environments, could become even larger problems in the microcomputer environment.

Agencies have just begun to address the issues related to uncontrolled microcomputer acquisitions. Also on the horizon are the problems related to the need to upgrade current systems to take advantage of the new technologies and the new capabilities.

What are some of the Federal initiatives that provide support in this area? There are several initiatives currently on the Federal level (GSA and DOD), directed at simplifying the acquisition of large numbers of microcomputers. The agencies are not required to follow these initiatives, which are intended to assist them in buying microcomputers. The interviewee at GSA indicated that their contract to buy microcomputers is part of a pilot project designed to reduce the complexities, paperwork, and time required to justify and receive microcomputers. This pilot involves three agencies: Agriculture, GSA, and Army; however, at the end of the pilot project, other agencies will be allowed to use this same mechanism to buy microcomputers.

GSA also discussed their Multiple Award Schedule Contract (MASC) program which has been expanded to included almost all of the popular personal computers. This program is intended to provide a quick and least-cost method of acquiring these small computer systems.

Additionally, in an effort to make microcomputers more readily available to managers, GSA is planning to open (Sept.,1983) a chain of contractor-operated microcomputer discount stores, which will provide guidance, training, and maintenance for the computers which it sells to the government agencies. The aim is to encourage managers who may not have considered using a computer to do so.

Agencies would like to avoid the paperwork requirement and the limited discounts available for single machine purchases, but few of those interviewed were doing volume purchasing. The Geological Survey is doing volume purchasing and is making microcomputers available to a number of its scientists and engineers. There are substantial discounts being offered according to the agencies. The interviewed official at the Office of General Services for New York State, indicated that discounts of 20% to 50% off the purchase price for two or more microcomputers, have been quoted. Interviewed officials indicated that volume purchases have the disadvantage of locking the agency into a particular level of technology and software, but at the same time, have the advantage of providing leverage and increasing vendor responsiveness. For example, vendors who are supplying the agencies with large numbers of microcomputers, may also provide other services, such as maintenance, parts, and training. On the other hand, if agencies are going to purchase microcomputers in quantity now, they know that the systems run now, are reliable, and that quality software packages are available.

One of the interviewees suggested that when negotiating for quantities of microcomputers, agencies should (a) look for opportunities to buy at discounted prices; (b) look for the best deals; (c) exercise care in knowing who will honor guarantees and warrantees and who is providing them, manufacturer or vendor. Sometimes substantial price breaks are available, but caution is required in terms of the ability of the vendor to deliver what has been promised, when it has been promised and to stand behind it, especially at the low price. One implication of low price is a lower level of vendor service, because the profit margin is low.

What constraints and/or requirements are imposed on agencies with respect to micros and what sources of help and information are available? The agencies discussed some of the existing regulations affecting ADP acquisition and their relationship to microcomputers. Explicit GSA procurement regulations (FPR 1-4.1109-6) exist for computer systems costing in excess of $300,000. Systems costing less are covered by GSA's Federal Supply Schedule Program. Several of the agencies indicated that despite these regulations, the Federal government is not yet prepared to control the acquisition and use of microcomputers that can be purchased for less than $10,000, the lower limit for GSA systems regulations. A provision in the Federal Supply Schedule authorizes the procurement of systems directly from the vendors up to the maximum ordering limitation, but calls for negotiation above that level. Federal procurement regulations to achieve quantity discounts, (FPMR 101-26.106), call for the consolidation of agency procurements. The interviewed individuals suggest that modifications to the regulations are required to reflect

the changed and evolving technological environment in which microcomputers are being acquired.

A related issue, which was of concern to all the interviewed agencies, deals with the acquisition and use of proprietary software and software licenses. The purchase of licensed software permits it to be used only in accordance with the provisions of the purchase agreement. These provisions frequently address the confidentiality of trade secrets and restrictions on the numbers and kinds of copies of the software and documentation that may be made and on which machines it may run. It is unclear, however, whether signing a license agreement is necessary to make it binding or whether even opening a package in which the agreement is visible is proof of agreement. It is of importance to agency management to know who is authorized to enter into such an agreement and the extent of liability incurred by the individual and the organization. Also in question is the extent to which the agency is required to make its people aware of the license terms. Individual agencies cannot solve this problem, but must be made aware of it. It is a government-wide problem which requires a government-wide solution.

An issue for the agency in formulating its policy is the set of legal implications of its contractual arrangements for software. Agencies advise their users that software must be legally obtained. However, implementation of the policy is difficult. The conflict arises when multiple users want to experiment with the software, but do not wish to invest the purchase price while experimenting. Several agencies have addressed a part of the problem with their demonstration facilities where legal copies of software are available for user experimentation and use. Another agency centrally procures software packages and provides support only for legal copies of the packages.

2.5 Personnel

Issue/Concern: What skills are and will be required to manage and utilize effectively the new information technology and what is the best way to transition to them?

Personnel considerations such as staffing, training, and job responsibilties are changing due to the influence of microcomputers. Traditionally, the users of computers and the providers of computer support each represent a certain mix of skills and responsibilities. The agencies realize that: a) the new microcomputer technology requires the user to have a different set of skills than in the past, b) that users will be required to perform some activities usually performed by the systems group, and c) that management needs to take a new look at how responsibilities should be assigned for this new environment. The agencies want to move from the "old" environment to the "new" in a way that minimizes disruption to the organization's effectiveness and to the well-being of its staff. However, the agencies interviewed seem to have addressed few of the personnel issues related to microcomputer use and support.

Agencies are concerned about their ability to hire, promote, and keep qualified personnel. The influx of microcomputers is causing the

job performed by many of the agency users to change. OPM job classifications and agency position descriptions do not yet adequately reflect the changing environment. In several agencies, users, (i.e., secretaries) want their job/position descriptions to reflect their use of microcomputers. Agencies are concerned that their slowness to properly incorporate changes to their personnel policies may negatively impact their ability, in the long run, to respond to technology changes. The salary structure of the government, the pace of introduction of microcomputer technology, and "promises" of private industry are inhibiting agencies from hiring and keeping the technically qualified workers. Agency management and workers alike are only beginning to think about the impact of the changing technology on such things as: productivity, the quality of working life, job security, and morale. Although private industry has also been slow to address these issues, organizations such as the Communications Workers of America have projects to examine these questions [COMM83].

A large and growing number of training vehicles are available to train both end users and those that support them. Classes, conferences, workshops, seminars, etc., address many aspects of the new technology and are being provided by several agencies. Appendix B contains a list of several other organizations that also provide these services. Programmed instruction and video/audio instruction are also being used as training media. The video disc combined with the microcomputer provides a powerful tool for personalized, interactive instruction. Projects making use of this technology in other government agencies and private industry have been described to us, but none of the interviewees mentioned this capability. Some interesting work in this area is being done by the Federal Interagency Group for Computer-Based Training. Their recently compiled document, Computer-Based Training Starter Kit, is directed at the training professional with little background in the application of ADP systems.

In most agencies, the assignment of microcomputer related roles and responsibilities is not yet formally defined, but is evolving. For example, the responsibilities of the ADP system staff is being shared with or assumed by microcomputer end-users. This sharing of roles is viewed by some agencies as an unnecessary duplication of effort. However, agencies acknowledge that they are not prepared to have the ADP staff provide all the services, training, and support that the microcomputer users require.

In the study for DOD [YOUN82] nine private industry companies were reviewed. One of the tables presented in that study, lists the microcomputer-related roles (support activities) and the group assigned responsibility for the roles. Where there is more central support provided to end users more of the roles are the responsibility of the systems group. In companies where there is little central support users have assumed the roles required to support themselves in the microcomputer environment. The first of the roles listed remained with the systems group; the others were shared or are assummed by the end users:

* long range planning

* requirements analysis
* hardware selection
* software package selection
* procurement negotiation
* application system development
* installation
* training
* operations
* maintenance
* post-installation review

It should be noted that these roles can take on different meanings in the microcomputer environment.

The differences in the assignment of responsibilities among the various roles observed in the nine companies appear to parallel those occurring in Federal agencies. Users have performed requirements analysis, acquired and installed their own systems, evaluated and selected software, and even performed some of the maintenance. In the mainframe environment these roles were the responsibility of the systems group. Agencies have yet to determine what skills are necessary to use the new technology, which of the roles users should be trained to perform or how these responsibilities should be delegated in the microcomputer environment.

3.0 Microcomputer Technical Considerations

In addition to the management issues, our study found that agencies had many questions and concerns related to the microcomputer technology. The following sections present the technical considerations that were addressed by the agencies.

Many agencies have produced guidance documents to assist the agency users in the selection of micrcomputer systems. The documents (Appendix C: Agency Documents) contain explanations as well as criteria for choosing the hardware and software components of a system. Where appropriate, information from these documents has been extracted and referenced in the following discussions of technical considerations.

The organization for this section is based on the methodology for microcomputer system selection used by the majority of the agencies interviewed to select their initial systems. Although not a formal process, the basic scheme consists of four phases: 1) determine the application requirements, 2) identify the software packages that support the applications, 3) select an operating system under which the software packages will run, and 4) select the hardware that can accommodate the software.

3.1 Application Requirements

In our discussions, it was assumed that the applications and the uses of a microcomputer were already determined. In each case, a set of functions to be computerized was identified. Although the set of application requirements varied among applications, the agencies identified several categories of features that were considered or required for existing or future systems.

3.1.1 Communications

The ability to share information and communicate with other computers was required by several applications. Questions about the physical connection, communications software, and data compatibility were raised. Several agencies are currently using variations of public domain communications software, MODEM 7, and the RS232 interface standard. Very few agencies are using local area networks (LAN), but LANs are viewed as a potential communications medium for the future. The examination of LAN features, architecture, transmission media, installation requirements, and selection criteria [ROSE82] is being performed in several of the agencies in anticipation of future LAN usage.

3.1.2 Resource Sharing

As resouces are shared, the integrity of the data and hardware is threatened. Often the sharing of information or hardware is required by the application. We were told of several applications which required the user to download data from a centralized data base, or access and exchange information from information utilities, software

exchanges, and electronic bulletin boards. Hardware such as printers, disks, and processors are also being shared due to the application needs or economics.

While pursuing this discussion, the following questions were raised:

* Who is responsible for the data?
* How is the integrity of the data maintained?
* Where should the 'valid' data reside?
* How are access priorities for shared hardware set?

Although no solutions were given, the agencies are cognizant of these issues and are examining alternatives.

3.1.3 Security

If sensitive (e.g. personal, proprietary, or otherwise confidential) information is handled by an application, that information must be protected against unauthorized access or disclosure. Such threats exist whenever the information is processed or stored on all systems but especially on those that are shared in any way. The degree of protection provided (and thereby its cost) should be a function of the specific application, the data it handles, and the environment in which it operates. Adequate protection of the system can safeguard the computer and its data from theft, accidents, errors, omissions, and intentional misuse (e.g., computer related crime).

In general, the agencies did not appear to be cognizant of or concerned with the security, privacy, or integrity of the microcomputer system. Several agencies believed that the security of single user microcomputers can be controlled by locking up the computer and floppy disks when not in use. However, some individuals expressed concern that multi-user systems did not typically provide an adequate set of security features. For example, a shared peripheral, such as a Winchester disk, offers the opportunity for users to accidentally or intentionally corrupt system integrity and data.

Although some concern about security was voiced, the general consensus was that the microcomputer industry will provide security features as the needs demand. It was pointed out that security features were becoming more important and were being designed into application and system software, firmware, and hardware. The need for TEMPEST (emanation security) approved systems was recongized by a few agencies, but was not, at that time, a major concern.

3.1.4 Reliability and Availability

The microcomputer system should be accessible, usable, and operate correctly. This concern was expressed by all the agencies. The levels of required reliability and availability varied with the agency and application. In general, microcomputers have proven to be reliable and thus stringent reliability requirements have not been set. To insure the availability of the system, several agencies buy

spare microcomputers as substitutes for failed systems. All the agencies make backup copies of software packages. These copies become the working programs, and the original packages are locked away.

Hardware and software products are sometimes released before being fully tested. The technical staffs at several of the agenices test and correct these software packages before distribution to the end-users. We observed that the early versions of the products often need fixes.

3.2 Application Software

Once the application requirements are determined, software is identified and acquired to perform the application. The following discussions highlight several of the software considerations expressed by the agencies.

3.2.1 Purchased or Custom Software

The choice of buying a software package or developing and writing software confronts the agency users. Prewritten, mass-produced software is readily available for most general and some specific applications. All the agencies encourage the use of these off-the-shelf software packages. Many of these packages can be customized to various types of terminals or operating systems via other software packages. Additional customization and modification of the software packages is being performed by many of the agency technical staffs. Packages are tailored to the users expertise, applications, and/or environment. Examples range from presetting terminal function keys, to modifing packages for specific communications capabilities.

Custom written software is software programmed to the application's specifications. For the majority of the applications discussed, custom software was not cost/beneficial or a timely solution. A limited amount of software programs is being written to support specialized applications, such as shipyard functions. These programs are distributed as off-the-shelf packages to the agency's client base.

3.2.2 Programming Languages

Some applications cannot be implemented using existing software packages. BASIC, C, COBOL, FORTRAN, and Pascal were the primary programming languages we encountered. Every microcomputer had a version of the BASIC language. The Microsoft BASIC was the most popular. A few agencies discourage the use of BASIC for complex system development and recommend languages such as Pascal or COBOL instead. Pascal is becoming widely used and is gaining acceptance and popularity.

Several cautions that emerged were:

* to consider which version of a language is available for the target microcomputer system (operating system and hardware),

* to consider the transferability of the language from one microcomputer system to another,

* to consider compliance to any existing FIPS and/or ANSI language standards (e.g. FIPS PUB 68, FIPS PUB 69, FIPS PUB 21-1 or ANSI X3.23-74 Level I).

3.2.3 System Requirements

The microcomputer software should be able to run on the existing or planned system configuration. The software packages require a specific minimum hardware and software configuration. Unfortunately, several Agencies learned this lesson after the purchase of the software. For example: LOTUS 1-2-3, an integrated software package currently requires the MSDOS 1.1 operating system, and two double density, double sided disk drives. The package was purchased for a system with MSDOS 1.0 and two dual density, single sided disk drives.

In our discussions, it was suggested that the user ask the following questions before purchasing a software package:

* Will the software fit the computer? E.g., the program may require 128K of memory but the target system has 64K.

* Do you have the appropriate hardware components and capacities? E.g., many of the more recent packages require double density, double sided disk drives.

* Do you have the appropriate version of the operating system or other required software? E.g., many of the more recent packages require newer versions of the operating system and/or other software.

* Is any prerequisite or additional software required? E.g., in addition to the operating system, the packaged software may depend on other software packages (e.g. mailers or spellers with wordprocessors).

* Can the user access the full range of features offered? E.g., the function keys defined by the software (e.g. wordprocessor) may not be operable or defined correctly.

* Can you take advantage of the full range of capabilities offered by the package? E.g., although VisiCalc can be loaded with a minimum configured system, the work space, size, and response time are severly limited.

Although many of these questions are similar, we found that the phrasing of the question resulted in different answers.

3.2.4 Application Integration

Can the output of one software package be used by another software package? This and related questions were raised by several agencies. Application integration refers to the process of combining individual application programs as building blocks which can be put

together to accomplish more sophisticated, multifunction activities. The agencies described application integration to be either the sharing of files between/among different applications; or the use of single packages which perform multiple functions, but which are "closed" with respect to the ability to add additional functions; or multitasking in which the user can easily switch from one task to another or all of these. Typically, the use of these integrated products will require a system to be upgraded to meet the current baseline configuration of that system (e.g. most recent version of the operating system or double density, double sided disks). Several agencies expressed an interest in and anticipate using packages such as MSA, LOTUS 1-2-3, LISA software, and VISI-ON.

3.2.5 Documentation and Training

Installation and user documentation for software packages is not always available or sufficient. These manuals include information for the user (or technical staff) on the installation and operation of the software on the target computer. Agencies discovered that software packages with adequate documentation were installed more quickly and used more readily than those packages without documentation. To augment existing documentation, several agencies have written their own user guides (a listing can be found in Appendix C: Agency Documents).

Manuals and on-line instruction are tools that enable the user to learn to use the software packages. We observed several forms of on-line instruction such as: interactive tutorials included with the package, help facilities, and menu-driven packages. One agency customizes all its software to include a menu capability. Several agencies expressed their preference for packages that offer levels of help geared to user needs. For example, agencies prefer a help facility that can provide a different level of help to novices and experienced users, or, a menu-driven package in which the menu can be eliminated by the experienced user.

3.3 Operating Systems

A number of operating systems exist for microcomputer systems. The agencies were faced with choosing an operating system that would perform on the existing hardware (if any) or that would run the selected software. Below are several of the considerations.

3.3.1 System Configuration

Not all operating systems can execute on all microcomputer systems. The processor (word size and type), and multi-user vs single-user operation were the two major factors involved in choosing an operating system. All the agencies with single-user, 8-bit systems have recommended the use of the defacto standard, CP/M, or a CP/M compatible operating system. No one 16-bit operating system was recommended by the agencies, but UNIX and UNIX-like, MS-DOS, CP/M-86, and UCSD P-system all were mentioned as possible choices. All the agencies discouraged the use of vendor specific operating systems, (e.g., TRS-DOS, APPLE-DOS).

3.3.2 Software

Is there a diverse and wide range of packaged software designed to run under control of the selected operating system? Typically, the more users of an operating system, the more software packages available for that system (both commercially and in the public domain). The quality of software, documentation and follow-up service also improves as the customer base increases. These are the reasons the agencies gave for choosing the CP/M operating system. We also noticed a developing constituency (government and in the private sector) for MS-DOS and Unix-like systems, and we expect the generation of software for these systems to increase as well.

3.3.3 Transportability

A major concern of the agencies is the transportability of software from machine to machine or vendor to vendor. Agencies want the ability to develop an application on one system and be able to run it, unmodified, on another system. All of the operating systems we saw enabled the user to transport software between "compatible" systems. But, due to its popularity and ease of transportability, CP/M and CP/M-compatible operating systems were chosen by most agencies for use on 8-bit microcomputers.

3.3.4 Utilities

The computing power and utility functions provided by the operating system vary between systems. Although no one explicitly mentioned the utilities, file and disk management capabilities were alluded to. Of importance was the ability to manipulate the information on the disk (e.g. list, copy, erase, etc.) and the ability to recover from a corrupted disk.

3.4 Hardware

For every component of the microcomputer system, a variety of hardware choices exists. The choices continue to multiply as the technology continues to change. If the application requirements, software packages, and operating system are already determined, the hardware options are narrowed. Agencies have recognized the difficulty and confusion facing the users in the selection of appropriate hardware components. Agency guidelines and handbooks (see Appendix C) were written to help the users with this selection task.

3.4.1 Basic System

A microcomputer system can be comprised of various hardware components. We observed a broad range of systems, from the sophisticated, complex system with several types of hardware components, to the simple, minimally configured system. Although the specific set of components differed between systems, all contained the same basic set of components. The basic system consisted of: a processor (8 or 16 bit), a minimum of 64K RAM, a terminal (preferably with a 24x80 character display), storage (at least 1 floppy disk, or hard disk access), and an RS232 port for I/O. Highly recommended

features were: a second matching disk drive, a printer and/or plotter for graphics.

3.4.2 Microprocessors

8-bit vs 16-bit vs 32-bit? The 8 bit microprocessor dominates the current microcomputer environment, but this situation is changing rapidly. Presently, the majority of agencies have standardized on 8-bit systems because until recently, the number of 16-bit systems and available software was limited. But, many of these agencies are exploring the 16-bit machines and their possibilities. Two agencies have recently chosen 16-bit systems exclusively. The reasons for these decisions were based on the now emerging maturity of the 16-bit systems and the application requirements for multi-users and multi-tasking. None of the interviewed agencies was actively pursuing the 32-bit systems, but their arrival is anticipated.

In addition to the word size, the microprocessor chips vary in capabilities. The performance, available software, speed, compactness, and ability to enable graphics and/or sound capabilities are several of the criteria evaluated by the agencies in chip selection. A comprehensive survey of microprocessors and chip families can be found in [TWAD82]. The Z80 microprocessor has become a de-facto standard and the chip recommended by the majority of agencies. We have also seen the 6502 (APPLE, ATARI, COMMODORE) processor, and the 16 bit processors: 8088 (IBM), 8086 (NEC), Z8000 (ONYX) and 68000 (TRS-80 model 16, FORTUNE Systems).

Users are not always limited to one processor type. Many agency users have emulated a second processor by plugging a special board into the microcomputer. For example, many APPLE users have plugged the SOFTCARD into the computer to emulate the Z80 processor and BABY BLUE can be used to emulate the Z80 in the IBM-PC. Other users have bought microcomputers with multiple processors integrated into the unit, such as the Motorola 68000 and Zilog Z80A in the Radio Shack Model 16.

3.4.3 Storage

The amount of storage on the microcomputer system can limit the amount of information that can be accessed, processed, and saved. The random access memory (RAM) and read only memory (ROM) comprise the system storage and are available in varying capacities. All the systems we saw had a minimum of 64K bytes of RAM. While the majority of agencies recommended that systems contain at least one 8", soft sectored, IBM 3470 compatible disk, we noticed an increasing number of 3+" and 5 1/4" disk drives. Almost all the systems had two floppy disk drives. One agency did not use floppy disks, but used Winchester hard disks, exclusively. Several other agencies plan to augment their existing and future systems with the hard disk capability. Although one agency used tape, it was for archival storage only.

3.4.4 Other Peripherals

The differences among printers or among plotters are significant.

The quality, speed, throughput, character sets and sizes, paper width and handling, maintenance, and computer interface were considerations in the selection of a printer/plotter. All the agencies had hardcopy output available on at least some of the microcomputer systems. The application requirements, compatibility with the microcomputer, and the printer/plotter cost were the typical considerations in determining the choice. Various magazine articles and charts were referenced as helpful sources of printer information [MIAS82, FEIG82].

To enable communications between the microcomputer and another computer, a modem is often used. Although modems were not discussed in detail, it was the primary medium for inter-computer communications. The factors identified in modem selection were: the requirements of the communications software and target computer, speed (300, 1200 baud), physical connection (RS232, IEEE 488), duplex (full, half), synchronization scheme (asynchronous, synchronous), and dialing (manual, autodial).

3.4.5 Maintenance

The hardware should perform and continue to perform correctly during use. Agencies have had very few problems with the microcomputer systems, but failures have occurred. Three maintenance methods were mentioned: in-house maintenance, repairs on a per call basis, and maintenance contracts with a vendor. We encountered all three of these methods. Generally, agencies with qualified technicians preferred to do their own maintenance. A few agencies suggested establishing maintenance contracts with the vendor from whom the microcomputer system was purchased, and suggested that the cost of such a contract should not exceed 2% of the retail cost of the system per month (typically 10-15% per year). And, finally, some agencies preferred to arrange for microcomputer system or component repairs on a per call basis.

4.0 SUMMARIES OF FEDERAL AGENCY EXPERIENCES

To determine how Federal government agencies were using microcomputers and how widespread that use, ICST staff interviewed employees from several Federal agencies and one State agency. In each case we tried to select a manager with some responsibilities for developing policies for the acquisition and use of microcomputers.

We developed a questionnaire to be used during the interviews which we hoped would elicit from the managers their experiences with microcomputers, including the impact that microcomputers are having on their work environment.

The first part of the questionnaire, part A, asked questions about policy, management, and administration, as it related to microcomputers. Part B inquired about the current microcomputer environment and experiences; part C asked questions about human or people considerations; and part D asked for references to other agencies and individuals known to be working or involved with microcomputers in their organizations. In some interviews we asked the questions, in other interviews the questionnaire was given to the individual to read and respond to verbally. In all cases, we recorded the responses; at a later date, the completed questionnaires were sent to the agency managers for review and correction. Six of the completed questionnaires were reviewed and returned to NBS.

The following section descriptions represent a snapshot of the level of awareness existing in the agencies at the time of the interviews.

In section 4.1 is the questionnaire used in the interviews.

In Section 4.2 are the individual summaries of agency experiences as extracted from the interviews and the completed questionnaires.

Section 4.3 is a tabulation of all of the responses of the agencies. The tabulation is a summary and is not intended to convey all of the information contained in the questionnaire.

Section 4.4 is a tabulation of the support functions currently being provided by the agencies to their end users.

4.1 SAMPLE QUESTIONNAIRE

Types of Questions to Perspective Interviewees (geared toward Federal users - needs to be modified for other groups)

A. Policy, Management, and Administration

1. Does your agency distinguish among micros, minis, and large general purpose computers? If so, how?
2. Who (person, position, organization) has overall responsibility for micros?
3. What policies (implicit and explicit), regulations, directives are operative with regard to micros?
4. Does the degree of control exercised over micros reflect a considered approach or one that's just evolved?
5. Are micros treated differently than other comparably priced resources (e.g., lab equipment)?
6. To what extent are the sequence and pace with which applications are introduced, controlled by higher level management?

B. Current environment/experience

1. What generic hardware and software are currently available and supported by microcomputers?
2. What telecommunications facilities are used to interconnect the micros and what type of interconnections are made?
3. What is the degree to which systems h/w and s/w are compatible/ transportable and can "talk" with one another?
4. To what degree is use of off-the-shelf vs. specially developed systems and software encouraged?
5. What has been the method by which you have identified and evaluated microcomputer h/w and s/w? What have been the specific features that you have looked for in specific application programs?
6. What application packages are being used including utilities and DBMS's?
7. To what degree are development, procurement, support and maintenance centralized?

8. What is the adequacy of vendor provided maintenance and support?

9. What microcomputer operating system and languages are used/preferred?

10. Are outside (videotex) information utilities accessed? Which ones? Extent of Use?

11. To what degree are programs and files shared among different users?

12. What problems have you encountered or do you foresee with regard to limitation on multiple uses of proprietary s/w? Is your agency attempting to deal with this contractually?

13. What levels of growth do you foresee over the next five years with respect to numbers of users and types of users and numbers and types of equipment for your organization?

C. People, Political, and Other Considerations

1. What provisions have you made with regard to staffing and training to facilitate the introduction, acceptance, and use of micros?

2. What unique personnel problems do you foresee with the infusion of microcomputers?

3. What unique political/organizational problems do you foresee with the growing availability and use of micros?

4. Do you anticipate any major changes in the physical work environment due to a major introduction of micros?

5. Who has been the most agressive in the introduction of micros - ADP or the user community?

6. How have the issues related to micros differed for ADP and the user community?

D. Other Contacts/ References

1. Have any sources of information/expertise been particularly valuable? If yes, which ones?

SUMMARY OF AGENCY INTERVIEW

DEPARTMENT OF AGRICULTURE (USDA)

USDA consists of many constituent agencies and staff offices. Ninety percent of USDA employees are located in the field. Policies for information management are formulated by the Office of Information Resource Management (OIRM), a departmental unit. In several instances, policy is developed through a multi-agency task force. As USDA is decentralized, responsibility for information management rests with the individual agencies.

The OIRM provides a centralized office for acquiring information and for introducing the agency staff to microcomputer technology and information. The agency staff, in turn, make available this information to their constituents.

Support from the OIRM consists of hardware and software demonstrations. Efforts are underway to acquire large numbers of microcomputers by the agencies and field installations. USDA is working with GSA on a schedule C pilot project for microcomputer procurement. This service is designed to save money and negotiations of the same hardware and software. To make microcomputer information available to agency heads within the Department, vendors are invited to demonstrate their products. The interviewee suggested that if standards were established, vendors could benchmark to the standards and it would not be necessary for an agency to buy identical equipment to have compatibility and transportability of software.

There is currently a large assortment of microcomputers in the Department of Agriculture. Most are being used to perform word processing. Microcomputers "talk" to the mainframe computers but not yet to each other. The interviewee stated that LAN's, which would allow the microcomputers to communicate, are being tested.

The OIRM stated that CP/M is currently the preferred operating system for the systems that are being procured. USDA's applications programs being supported by microcomputers include Green Thumb, a market information system for farmers. Farmers also have access, via their microcomputers, to packages developed at Land Grant Colleges and made available as public domain software (the specific applications were not identified). Other microcomputer supported applications include the publishing of documents (a very large operation), electronic mail (more than 3000 users), and the management of data bases, as well as the usual applications of word processing and financial analysis.

The OIRM participates with other Federal agency representatives in the Special Interest Group on Microcomputer Applications and Technology, SIGMAT, which exchanges information, performs some research, and explores various areas related to the technology. In conjunction with the USDA Graduate School, the Department of Agriculture has developed an Information Technology Center.

The Center

* conducts demonstrations, classes and seminars on a variety of hardware and software.

* offers self-instructional courses through computers and video tape.

* offers assistance in applying computer technology to professional and administrative uses.

* houses a technical library containing leading periodicals and publications on computers.

* provides a room for computer vendors to demonstrate their equipment.

SUMMARY OF AGENCY INTERVIEW

DEPARTMENT OF ENERGY

The Department of Energy includes a number of field installations in addition to its Headquarters, located in downtown Washington. The interviewee is a staff member in the Office of Computer Services and Telecommunication Management (CSTM) which operates the Headquarters Administrative Computer Center located in Germantown, Maryland

Microcomputer applications are introduced and managed by higher level management; very few microcomputers have been introduced by end users. Microcomputers currently being used at the installation are Gnat, Superbrain, Apple, IBM PC's, Molecular Computer Systems, and TRS-80 computers.

The regulations followed in the procurement of microcomputers are the same as those for mainframes, until specific policies are developed for microcomputer procurement. Support functions are somewhat centralized within Headquarters. The maintenance is handled by an on-site contractor and is primarily the replacement of a board or device. A training facility allows for hands-on experimentation with hardware and software; tutorials are available; and a telephone hot-line makes available direct help to remotely located users. A formal support center which would maintain a problem file for quicker responses to familiar problems is under development.

The most frequently performed microcomputer applications are word processing and spread sheet analysis.

The emphasis is on packaged software, as indicated by this and most of the other interviewed agencies. Programming is not encouraged unless it is to customize a package for a specific application. The interviewee would like to see a broader range of packaged applications so that customized software could be avoided. DOE is accessing several videotex services via its microcomputers: a legal data base, a legislative data base, and the NY Times Index. The interviewee suggested that the Government should study the possibility of using videotex and microcomputers as a possible vehicle for delivering some of its products.

SUMMARY OF AGENCY INTERVIEW

FEDERAL COMMUNICATIONS COMMISSION

The interviewee is a staff member in the office of the Associate Managing Director for Information Management, one of six bureau chiefs under the Commissioner.

The Commission developed a plan more than two years ago to show the FCC's computing needs for the 80s. The Plan outlined an approach to a microcomputer network which would, among other functions, permit the exchange of mail and the sharing of resources. The network is being developed and some components of the system have been acquired.

Microcomputers are individually justified and centrally procured multi-user systems. All have 16-bit processors and run the UNIX operating system. The microcomputers will communicate via the FCC-net, now under development.

At the time of the interview, FCC had 10 multi-user systems: ONYX and ZYLOG microcomputers. Each had fixed disks and tape archiving capabilities. Maintenance for one of the systems presented problems because parts were not always available, but the other systems have been quite reliable. Single user systems are not being acquired and do not fit within the planned network. Management is driving the acquisition of these systems and the applications planned for them.

The software consists mostly of off-the-shelf packages which have been customized. In general, software that is under consideration for purchase, is evaluated by those who are going to use it. Some software has been developed in-house, but resources are limited and do not allow for much programming. Some of the applications being supported by microcomputers include personnel action tracking, automated purchasing, and management-by-objectives. The interviewee stated that a number of the current microcomputer applications make use of data base management systems which he sees as being a major tool in the creation of applications for the network.

The FCC makes use of one of the videotex information services, LEXIS, and accesses this data base by way of the microcomputer.

The ADP staff provides the support for the UNIX-based systems; but no centralized support is plannned for users of single user systems running under CP/M. Eight bit systems are discouraged and the use of floppy disks is not recommended. The emphasis is on microcomputers that will be shared by a number of users, a system that is controlled by the higher levels of management, and applications that are introduced by management for agency-wide benefits.

SUMMARY OF AGENCY INTERVIEW

GEOLOGICAL SURVEY

An agency of the Department of Interior, the Geological Survey has widely scattered field installations, and has found the use of microcomputers an effective way to communicate with those installations.

Geological Survey has made available microcomputers to its scientists and engineers in field locations around the country. Its central support group has been "selling" the microcomputers and encouraging their use. Programs have been sent to remotely located users via telecommunications facilities which allow the microcomputers to download software from a mainframe.

The ADP staff has been most aggressive in its efforts to make this tool available and to provide the required support for its use. They have made volume buys of microcomputers, developed guidance documents, and provided demonstrations of the microcomputer's capabilities. Recommendations for hardware components and operating systems provide a framework in which the users have a variety of choices of components and peripherals. If recommendations are not followed, the user could find that assistance is not available for the system that was chosen. The plan is to provide support for the systems that are staff recommended and for which the staff has expertise.

Geological Survey plans to canvas its microcomputer end users world-wide to determine their future needs in an effort to give them better and more timely service and support. The survey will also provide a picture of the current microcomputer environment and a relative count of the number of microcomputers in the agency.

Some of the first microcomputers bought in large quantities by the Survey were Intertec Superbrain computers, with 8-bit processors, 64k RAM, floppy disks and CP/M operating system. Approximately 150 microcomputers were bought in the first batch and at least that many were planned for a second acquisition. The Survey may have been one of the first agencies to buy microcomputers in volume. As a result, there is a high degree of compatibility and transportability of software among systems, and these systems are able to "talk" to each other.

Among the applications being supported by microcomputers are word processing, data base management, text editing, and some computations. But, as in several of the other agencies, some programming is being performed. Packages are recommended, but packages have sometimes required customizing to satisfy the requirements.

The Survey is using a variety of communications software, including RCP/M (remote CP/M), and the public domain software package, Modem 7, to allow microcomputers to talk to each other and to mainframe computers. Their variation of Modem 7, GS-COM, has been made available to other agencies as has their in-house developed

Superbrain users manual.

An electronic bulletin related information is operated from the Survey for the benefit of its users. However, other agencies can also access the bulletin board and contribute to the information that is collected and exchanged.

SUMMARY OF AGENCY INTERVIEW

AIR FORCE DATA SYSTEMS DESIGN CENTER, Gunter Air Force Center

This interview was held with the Chief of the Air Force Small Computer/Office Automation Service Organization (AFSCOASO), a part of the Air Force Data Systems Design Center (AFDSDC) at Gunter AFS, Al. It is the center of expertise for small computer systems for the Air Force. Each major Air command has its own technical service center with responsibility for procurement and support of microcomputers.

AFSCOASO's goal is to maintain and support information, data, and software for microcomputers. This service organization received its authority in May, 1982, with overall responsibility for microcomputers.

The Air Force makes no distinction between microcomputers and minicomputers, except in terms of cost, required physical environment, and user processing time available. The acquisition procedures are essentially the same as for other ADP systems; however guidance documents developed by AFSCOASO pertain only to microcomputers. Those guidance documents include: Microcomputer Guideline, Diskette Handbook, OA Survey, and sample RFP's. The guidance documents recommend that, to insure AFSCOASO support, the de facto industry standards be used: CP/M operating system, S100 bus, 8" floppy disks. Additional support is provided to users through a tri-service procurement agreement to purchase large numbers of microcomputers. No centralized maintenance support is available, but major Air Commands are advised to establish maintenance agreements with vendors from whom the microcomputers are purchased. It is also sugested that several extra microcomputers be purchased for replacement of microcomputers being repaired.

The Air Force would like to arrange an AF-wide license for multiple copy discounts of proprietary software, but recognizes that there are some issues related to such an arrangement that must first be addressed.

One of the aims of AFSCOASO is to promote software transportability. The use of CP/M compatible software and 8", CP/M formatted floppy disks has allowed software to be taken from micro to micro. These applications range from electronic spreadsheet analysis and data base management to specific applications of the Air Force. Included in the hardware are Apple, Cromemco, and TRS-80 computers. Telecommunications facilities are under development and a local area network will cable-connect AFSCOASO microcomputers with various host processors. Being explored are interface protocols and the communications package, Modem 7.

An on-line information system, DIAL-A-LOG, developed by this group, is available via the ARPANET. It provides microcomputer users a software exchange, research index, user groups, news, etc. Users and creators of programs and files which have wider applicability than their individual use are encouraged to share these resources through the DIAL-A-LOG system.

SUMMARY OF AGENCY INTERVIEW

HOUSE INFORMATION SYSTEMS (HIS) of the Committee on House Administration, U.S. House of Representatives

The Information Resource Planning Office within the Office of the Director, House Information Systems, is responsible for the management and procurement of personal computers within House Information Systems (HIS).

Currently under development is an overall plan for support of personal computers for the House of Representatives. Within this plan, two major support areas have been identified:

* general support which would include the establishment of a personal computer information center. HIS staff would provide information about personal computers, hands-on demonstrations, develop "how to" instructions, and conduct training classes on the use of personal computers and software.
* a second support area would be HIS staff doing extensive software analysis and prototyping. Emphasis would be on electronic spread sheet, data base management systems, 4th generation languages, word processors, and graphics.

One service identified which members could benefit from, using personal computer technology, is applying value-added capability when using the extensive information currently maintained on the HIS mainframe computers. An example would be the Members downloading Federal grant or contract information linked to census data to his personal computer. Then the Member would do his own analysis of his Congressional district with the value-added software recommended by HIS. If the Member did not have personal computer technology in his office, he would be able to use personal computers in the information center with assistance or coaching provided by HIS staff.

It is expected that Congressional staff will be exposed to personal computers from many different manufacturers. HIS plans to evaluated 10 to 15 microcomputers. Some evaluations have already been made. HIS staff will then provide clearinghouse type information on selection and use of personal computers. Standards will be established for the evaluation of both hardware and software with emphasis being placed on CP/M, MSDOS, and DEC-based operating systems.

The Congressional Budget Office and the Office of Technology Assessment are now the most extensive users of personal computers. The use of personal computers by the House as a whole has started but is minimal at this time. However, with the continued growth of our LAN, HIS is planning to include personal computer support as part of our future service development plans.

SUMMARY OF AGENCY INTERVIEW

DEPARTMENT OF LABOR

The Office of Policy and Review within the Department of Labor has oversight responsibility for data processing. It has developed guidelines to assist managers in the acquisition of microcomputers. This policy encourages the use of multi-user systems and emphasizes compatibility and convertibility of systems, programs and data. Unlike the more scientific agencies, the use of microcomputer systems in DOL is management driven and the applications are more administrative in nature. They are driven by high level management and changing legislation.

Implicitly, single user systems and floppy disks are not encouraged. The concern is that management should decide and maintain control of projects supported by computers. Labor does not want a critical system residing with one person. At the same time, the agency wants to encourage the use of the new technology.

When interviewed, the manager indicated that 30 multi-functional microcomputer systems were being procured to handle both interative and batch jobs and to connect to Labor's COM-10 network. Labor's Directorate of Personnel Management is currently developing a comprehensive program to train staff and management in the use of their soon to be installed computer systems. The agency is also planning to acquire a value added network to which their microcomputers will eventually be connected.

Labor does not have a great many microcomputers at this time and for this reason has not formed strong preferences for operating systems. However, the agency is leaning towards UNIX-like systems that support languages such as Pascal and Fortran. The microcomputer would support applications such as data entry, remote job entry, and word processing.

One of the concerns of the interviewee is the problem of interfacing data base management systems from a non-host computer to a host system. The interviewee expects applications to be developed around agency data. Microcomputers would then download data from mainframe computers to data bases residing on microcomputers to develop those applications. prepared by the Labor Department for its end users.

SUMMARY OF AGENCY INTERVIEW

NAVDAC - Washington, D.C., and NARDAC - Norfolk, Va.

NAVDAC is responsible for the support of non-tactical ADP resources for the Navy. There are seven regional commands, NARDACs, under NAVDAC control. NARDAC-Norfolk has been charged with providing a centralized group to evaluate and support microcomputers within the Navy. The Micro/Mini Evaluation Team was established to support this function.

A packet of documents on microcomputers, evaluations, and recommendations has been written and is being distributed by NARDAC-Norfolk. The document provides much needed information and shows current NAVDAC plans for microcomputer support. As with other agencies that have established guidelines for the selection of microcomputer systems, not all available systems can be supported with the limited staff and current capabilities. For users who plan to look to central sources for microcomputer assistance, there needs to be some guidance as to what support can and will be provided. These documents are intended to provide that guidance but are not intended to establish policy.

NAVDAC has established a minimum requirement specification which includes a microprocessor that executes the 8080 CPU instruction set, 64k bytes of RAM, two 8 inch soft-sectored (floppy) disk drives, 24 line x 80 character display terminal, and the CP/M operating system. These are only recommendations to assist users who are planning to acquire microcomputer systems. But recognizing that the Navy has as a primary concern the portability of software and programs, the decision not to follow the recommendations should be carefully considered.

The Evaluation Team has identified and evaluated hardware and software through hands-on testing of manufacturer's products. Documentation and user manuals are compared with the actual operation of the computer systems and human factors (i.e., ease of use, ease of learning, ergonomic features) are also evaluated.

Procurement of microcomputers, applications development, and computer maintenance are not functions supported by the Evaluation Team. The ADP group within each NARDAC is responsible for these activities. Here, as in other agencies, it is recommended that a maintenance agreement be purchased along with the microcomputers. (A tri-service procurement contract was negotiated some time ago and hundreds of microcomputers have been acquired under this agreement).

A variety of applications is supported by microcomputers in the various commands including: correspondence control; fuel, water, and ship requirements predictors; and forecasting based on actual requirements.

Proprietary software is being handled according to the purchase agreements. When multiple microcomputers are acquired, multiple copies of the software package are acquired. There is under way an attempt to obtain software license agreements for wider applicability

and multiple computers. The logistics of handling a large number of copies of propietary software packagesand their licences could present a problem of unmanageable proportions. The Evaluation Team suggested that new arrangements would be considered to facilitate the tracking of multiple copies of hardware and software for this new environment.

NAVDAC periodically sponsors a conference on microcomputers for Naval personnel. In addition, the command at Norfolk is able to demonstrate microcomputer equipment and software; provides a hands-on capability for a small number of systems; has available a telephone hot-line for quick responses to user questions; and maintains a microcomputer bulletin board. Microcomputer workshops are also held to facilitate their introduction and use.

SUMMARY OF AGENCY INTERVIEW

NATIONAL OCEANIC and ATMOSPHERIC ADMINISTRATION (NOAA)
Department of Commerce

NOAA has a large constituency of approximately 14000 individuals. A sizeable number of the scientists and engineers in this group have acquired microcomputers, many of them without the assistance or knowledge of the ADP staff.

There is a support group which has been assisting its microcomputer users in a very basic way: defining requirements, reviewing purchase order requests, and providing guidance. It has developed guidance documents to assist its end users in the selection of applications packages and microcomputers (they are not procured centrally), and provides assistance in customizing software that doesn't quite meet the user's requirements. The support group also sponsors an annual 2-day symposium on microcomputers and ADP systems.

The increasing demand for support has led to the planned establishment of an information resource center to better use its staff resources and to better serve the end users.

Because the microcomputers were, in many cases, individually acquired, there are many different makes and models and no clear indication of the total number within the agency, nor of the specific applications for which they are being used. To get a picture of the current environment, the agency surveyed its constituents and developed a data base of hardware and software now being used and of the needs of the users. The survey determined that many of the scientists have unique requirements, that the applications are frequently not transportable and do not need to be. Some of those applications are: ship documentation; solar, earthquake, and permafrost studies; as well as the more common applications of editing, data entry, and electronic spreadsheet analysis.

There are some communications between the mainframe and microcomputers. CP/Net is available and compatible with the recommended CP/M compatible operating system. Microcomputers are recommended by generic specifications, which provide the user some choice in the selection of system components.

Though the majority of the identified systems have 8-bit processors, the agency , in its guidance documents, does look to the future with specifications for 16-bit systems, and suggests that computers should communicate using the IBM BSC and the 3780 protocol.

SUMMARY OF AGENCY INTERVIEW

STATE OF NEW YORK

The Office of General Services of the State of New York was the only non-Federal agency interviewed. It is a marketing and research office within the Office of General Services concerned with the ADP equipment needs for all state agencies and universities in the state and responsible for all matters pertaining to microcomputers.

The Office of General Services procures all microcomputers for the state and leases them to the state agencies and universities; it also acquires software packages,(i.e., word processors, spread sheets, and data base management systems), for sale only. The agency or university department determines the applications to be supported, authorizes the acquisition, and sets the pace for the entry of the systems. Other application specific software is obtained by the end user.

Multi-vendor, volume quantity contracts are used by the OGS to acquire hardware and some basic software packages. Through the OGS, software support is provided to the individual who purchases the software package. The Office uses this mechanism to meet the requirements of the software license.

At the time of the interview, the OGS was not aware of microcomputers being connected to other systems. For that reason, not much had been done about the marketing of communications facilities or software.

Systems being acquired by OGS consisted of 8-bit processors usually running under the CP/M or MP/M operating system and included maintenance as part of the contract. Systems being acquired by OGS support education-oriented applications, single user and multi-user business oriented systems. The business systems must use CP/M or multi-user CP/M compatible operating systems. All systems must include a one-year, on site maintenance contract.

To facilitate the introduction and use of microcomputers, the Marketing and Research Office (MRO) stages business shows at which vendors are invited to show and demonstrate their products. Agency and university staff are invited to come and participate. The MRO has a facility where it demonstrates and allows end users to operate the in-house microcomputers and related software; its staff is available to answer questions and assist users with the specifications for a system.

SUMMARY OF AGENCY INTERVIEW

WALTER REED ARMY INSTITUTE OF RESEARCH (WRAIR)

The Director of the Division of Biometrics (DOB) of the Walter Reed Army Institute of Research was interviewed. DOB is concerned with establishing and managing the policy and procedures for ADP acquisition and use. In its recently completed five-year plans, DOB has included the use of microcomputers.

The procedures followed in the acquisition of microcomputers are the same ones followed in the procurement of other ADP systems. Though the level of justification and review required for microcomputers is not quite as extensive as for mainframe systems, WRAIR must obtain approval from higher level headquarters.

The Advanced Systems Working Group (ASWG) within WRAIR is developing policy, guidance documents, and documentation to encourage and assist end users and potential users in the acquisition and use of the technology. Microcomputer game playing is allowed during off-duty hours to encourage staff to familiarize themselves with the systems.

All microcomputers are procured through this office (DOB), with maintenance contracts coordinated through the command at Fort Dietrick. Although some maintenance contracts exist, many microcomputers are not covered. As a result, some microcomputer repairs are performed in-house. WRAIR recommends that maintenance contracts be negotiated at the time of purchase of the microcomputer. DOB would like to see more microcomputers installed, but due to its limited staff, cannot cope with a faster paced implementation schedule. Currently, the value of hardware installed is approximately $150,000 and includes Apples, TRS-80s, as well as a half dozen other brands, and plotters and printers. Microcomputers communicate with a VAX minicomputer, use it as a file server, and through it, "talk" with other microcomputers. Telecommunications software being used is the ACCESS III terminal program for Apple computers and LCOMM for TRS-80s.

Applications range from record keeping and verification procedures to medical research applications to determine stimulus-response time for the neurologically impaired. Applications software are often developed in-house to meet specialized requirements. Routine administrative applications packages are purchased off-the-shelf as available, i.e., mail list handlers and graphics.

Microcomputer training courses are provided periodically, and are also incorporated into the physician training programs to make physicians aware of the tool and to give some sense of how they can be used in research. Some end users have been as aggressive as DOB, and have asked for microcomputers after having observed their use and recognizing their potential to assist the medical research scientist.

The Director of DOB voiced some of his concerns about the microcomputer technology and its impact in related areas:

* qualified and experienced personnel - how do you hire and keep them in a competitive environment where the military pay scale and career paths limit potential advancement?
* mistakes - with the popularity and ease of justification of microcomputers, the potential for making costly mistakes is great; big mistakes adversely affect the future use of microcomputers
* maintenance - a potentially big and costly problem

At this time, the extent of microcomputer use and the pace of its introduction into various programs are such that the concerns which were mentioned have not become major problems.

SUMMARY OF AGENCY INTERVIEW

SMITHSONIAN INSTITUTION

The Smithsonian Institution engages in scientific research, publication, museum exhibition, and the care of collections.

The individual interviewed at the Smithsonian, is a member of the Office of Information Resource Management (OIRM) staff, who provides assistance or support to the scientists who desire to use microcomputers or are already using microcomputers. Assistance is frequently provided for requirement specifications for hardware and the selection of software.

Microcomputers are procured by the individual scientists at the Smithsonian with grant funds for research projects which could benefit from the use of automated procedures. The scientists negotiate directly with the vendor for the system of his or her choice. The interviewee reviews and recommends various software packages, and assists users in communicating with the mainframe computers and in transferring files between mainframe and microcomputers. Formal training classes are obtained from an outside training concern.

Files are transferred to and from the mainframe via telecommunications facilities, but between microcomputers, floppy disks are exchanged when it is possible to do so. A local area network is slowly being implemented along the lines of the NBS local area network.

Microcomputers are supporting inventory applications (the inventories are stored on the mainframe's mass storage device), bibliographies, manuscript preparation, text editing and financial spread sheet analysis.

End users are encouraged to obtain maintenance agreements at the time the microcomputer is purchased, but some are maintained by the scientists, themselves, at least to the board level.

SUMMARY TABULATION OF AGENCY QUESTIONNAIRES

The agency responses to the questionnaire are summarized below. They have been abbreviated and should not be taken as absolute, qualified responses.

KEY to agencies:

A ....Air Force System Design Center
B ....Department of Agriculture
C ....Department of Energy
D ....Department of Labor
E ....Federal Communications Commission
F ....House of Representatives
G ....NAVDAC/NARDAC
H ....NOAA
I ....Smithsonian Institution
J ....State of New York
K ....USGS
L ....Walter Reed Army Institute of Research

KEY to responses:

Y ....Yes
N ....No
E ....Evolving
P ....Planned
D ....Under development
O ....Neither
C ....Considered
- ....Question not asked
or answer not known

	AGENCY											
QUESTION	A	B	C	D	E	F	G	H	I	J	K	L
Micros distinguished from other computers?	N	Y	N	N	N	N	N	N	Y	Y	Y	N
Written policies, guidelines, etc.?	Y	Y	N	Y	N	E	Y	Y	Y	Y	Y	P
Degree of control reflect a considered approach?	C	C	E	O	C	O	E	E	C	C	C	E
Sequence and pace controlled by upper level management?	-	Y	Y	N	Y	Y	-	N	N	N	Y	N

QUESTION	AGENCY A	B	C	D	E	F	G	H	I	J	K	L
Volume purchases considered/underway?	Y	Y	N	N	-	N	Y	-	N	Y	Y	N
Are telecommunication facilities used to interconnect micros?	Y	Y	Y	N	D	D	N	Y	Y	N	Y	Y
Is software/data transportable?	Y	-	E	N	Y	N	Y	N	Y	-	Y	Y
Is software primarily off-the-shelf-packages?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Is hardware and/or software evaluated?	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
Centralized- procurement?	N	N	Y	N	Y	Y	N	-	N	Y	Y	Y
maintenance?	N	N	Y	N	Y	C	N	N	N	Y	Y	N
support?	Y	Y	Y	N	Y	Y	Y	Y	N	Y	Y	Y
Is user training provided?	Y	Y	Y	N	Y	P	Y	Y	N	Y	Y	Y
Are conferences, etc. conducted?	Y	Y	N	N	Y	C	Y	Y	N	Y	Y	N
Is technical assistance available?	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
Is an electronic information exchange available (BBS)?	Y	Y	N	N	N	N	Y	N	N	N	Y	N
Are major changes to the work environment anticipated?	N	N	N	Y	N	N	-	N	-	N	Y	Y
Have/are the users more agressive than the ADP community?	N	Y	Y	N	N	Y	-	Y	Y	N	Y	Y

TABULATION OF PROVIDED SUPPORT

The Agencies that were interviewed provide various types and levels of support to their end users. The chart below is intended to show the support functions and the levels of support provided by the agencies.

	LEVELS OF SUPPORT			
SUPPORT FUNCTIONS	Not known	Little or no support	being developed	full support provided
Central Support staff	1	2	2	7
Demonstration Center	1	5	2	4
Training	1	2	2	7
Manuals/documents	1	2	2	7
Conference/workshop	1	6	-	5
Information exchange (BBS, user groups, newsletters, etc.)	3	3	2	4
Software customization	2	2	1	7

* The numbers indicate how many agencies provide the support function and the level of support provided.

5. CONCLUSIONS

As was previously stated, the microcomputer and its related areas are changing rapidly. It must be recognized that the following observations and conclusions represent a snapshot (as does the entire document) of this moving target. We base our conclusions on the information gathered from the interviews, informal discussions, and information gathered from various sources (agency policies, periodicals, information services, vendors, etc.).

5.1 Observations

The excitement generated by the microcomputer and its use is affecting everyone. The set of potential and current users is not limited to ADP or scientific communities, but encompasses all employee disciplines within an organization. Thousands of microcomputers are already in the work environment and this number continues to grow.

The pace of the microcomputer technology and the numbers of options and possibilities has created much confusion. The public is looking for general guidance in selecting microcomputer systems as well as help with their installation and operation. Organizations are recognizing these needs and are developing structures to provide information, evaluations, and support. An effective approach is to offer centralized support on an incentive basis. That is, support functions are available for a limited set of hardware and software products, and users are encouraged to use these recommended products if support is desired. This incentive-based microcomputer support is the approach being taken in most of the agencies that were interviewed.

The relationship between the microcomputer and the mainframe is not being addressed. The microcomputer has not been viewed in terms of the organizations' total information resources, but rather as an individual tool to enable the user to more efficiently and effectively do his/her job.

In general, the methodology for selecting a microcomputer system differed from that of selecting a mini or mainframe computer. Although not necessarily a formal procedure, the selection process for a microcomputer consisted of four major steps. First, the application requirements must be determined. Software packages that support the application should be identified, examined, and if possible tested. After the selection of an appropriate set of packages, an operating system that can operate the packages must be chosen. Finally, the hardware necessary to run the operating system and software application packages is selected. A strong consideration in the final selection is the evaluation of the microcomputer marketplace and future trends.

There are numerous variations of a microcomputer system. But the current 'basic' microcomputer system is a single user, stand-alone system that uses an 8-bit processor with 64K RAM, and two floppy disks. The major applications of the system are word processing,

spread sheet analysis, and data base management. The software is predominately single function, off-the-shelf packages.

New systems are evolving that incorporate more powerful hardware and software. This emerging system is becomming the new 'basic' system and consists of a 16-bit processor with a minimum of 256K RAM, a hard disk or other large capacity storage, and capable of supporting multi-users, multitasking, and peripheral sharing. These systems will use integrated software packages to perform the same applications as their predecessors in addition to graphics and a local area networking capability.

5.2 Trends

The variety, power, and sophistication of the hardware and software continue to increase. The non-portable office system is becoming supplemented by the portable microcomputer system. The traditional 8-bit processor is being replaced by both multi-processor and 16-bit processor systems. Single sided, single density floppy disks are being replaced by the double sided and double density floppy disks, and the hard disk is being included in the storage scheme. Software for the microcomputer systems will continue to be predominately off-the-shelf packages. The newer software packages will be powerful programs that enable the interaction of applications (e.g. integrated software). To support these packages, more powerful and faster hardware will also be required (e.g. double sided, double density floppy disks).

The need to provide, disseminate, and share information continues to grow. The need will be met by the development and expansion of services such as conferences/symposiums, information clearinghouses, electronic information exchanges (i.e., electronic bulletin boards, electronic mail), and user groups. Effective end-user training facilities are being developed. Training will become readily available and take the form of manuals, tutorial primers, and documentation; video discs; class instruction; or interactive, computer-assisted instructions separate from or integrated with the software programs.

There is an increasing emphasis on applications and technologies that address resource and data sharing. Storage and output devices (disks, printers, plotters) will be shared between systems and users. Local area networks or other interface software will connect microcomputers to each other and/or mainframe computers. The microcomputer system will become integrated into the total information management scheme.

5.3 Examples of Agency Microcomputer Activities

The lessons learned by and from the interviewed organizations have been beneficial and encouraging. Although mistakes were made, the consequences were viewed as a learning experience. This section will cite several of the operational activities noted in our interviews with the agencies. The set of activities and cited organizations is not exhaustive and is not meant to be. The omission

of an organization is not an indication of that organization's lack of activity or progress.

Aquisition:

New York State: The acquisition of all microcomputers, peripheral equipment, and software is centralized in the Office of General Services. Microcomputer systems are leased to the requesting agencies.

USDA: Microcomputer vendors are invited to discuss and demonstrate their equipment.

USDA, USGS: Arrangements with vendors have been made to enable the purchase of microcomputer hardware and software at volume discounts

Guidance Documents:

AF Design Center, NARDAC, NOAA: Guidelines were written to assist the user in selecting a microcomputer system. The published guidelines offer hardware and software considerations, criteria, and explanations. The documents are dynamic and will be updated as circumstances demand.

Support Structures:

AF Design Center, NARDAC, USGS: A centralized support organization provides hardware and software evaluations, guidance, training, user-guides, and technical assistance.

FCC: After the technical staff identifies a set of potential software packages, several of the future end-users evaluate the packages and make recommendations. Based on these recommendations, the technical staff makes the final selections.

Information Exchange:

AF Design Center: A menu-driven, on-line system was developed to promote the exchange of information between Air Force small computers. The system, Dial-A-Log, provides five basic functions: a bulletin board subsystem, user group subsystem, software exchange catalog, research index, and a conversational mode.

USGS: A computer-based bulletin board system (RCP/M) provides the capability to exchange and distribute software and information.

6. ACKNOWLEDGEMENT

The authors acknowledge the professional expertise and assistance provided by John Barkley and John Junod of NBS, and Dean Halstead and Carol Keferley of FEDSIM in the formulation and preparation of this report.

Special thanks are extended to the representatives of the following Agencies for their contributions and participation in providing information for this report.

Department of Agriculture
Department of Commerce (NOAA)
Department of Defense
  Air Force System Design Center
  Navy Data Automation Command
  Navy Regional Data Automation Command
  Walter Reed Army Institute of Research
Department of Energy
Department of Labor
Department of Interior (USGS)
Federal Communications Commission
General Services Administration
House of Representatives, House Information Systems
Smithsonian Institutions
State of New York

References and Suggested Readings

[ANDE82] Anderson, Gordon E., and Kenneth C. Shumate, "Selecting a Programming Language, Compiler, and Support Environment: Method and Example," IEEE Computer, August, 1982, pp. 29-36.

[BURA82] Burawa, Alexander W., "Choosing a Printer for a Small Computer," Popular Electronics, March, 1982, pp. 37-44.

[CARD83] Card, Chuck, "A Proposed Floppy Disk Format Standard," Byte, February, 1983, pp. 182-190.

[COMM83] "Committee on the Future Report," Communications Workers of America, March 1983.

[COMP82] "Corporate Users Vastly Underestimate Costs of PCs," Computer Age, EDP Weekly, December 27, 1982, pp. 1-3.

[DAHM83] Dahmke, Mark, and Ed Jones, "CPM Operating System", Popular Computing, February, 1983.

[DATA82] Data Decisions, "Systems Software Survey," Datamation, December, 1982, pp. 96-138.

[DATA83] Data Decisions, "End Users Rate Applications Software," Datamation, March 1983, pp. 132-154.

[DIET82] Dietz, Lawrence, "Computer Security: Not Just for Mainframes," Mini Micro Systems, June, 1982, pp. 251-255.

[DODG83] Dodge, John, "Users Rank Priorities, Concerns, and Intentions in Software Survey," Software News, January, 1983, pp. 25-26.

[EDPA82] "Some Users Want Their Own Computers," EDP Analyzer, June, 1982.

[EDWA83] Edwards, John, "The Desktop Buyer's Guide to Database Management Systems," Desktop Computing, March, 1983, pp. 42-49.

[FEIG82] Feigel, Curtis P., "BYTE Printer Directory," Byte, March, 1982, pp. 278-296.

[GAO83] "Subject: Small Computers in the Federal Government: Management is Needed to Realize Potential and Prevent Problems (GAO/AFMD-83-36)," Letter to Director, Office of Management and Budget, March 8, 1983.

[GARE83] Garetz, Mark, "The IEEE Standard for the S-100 Bus," Byte, February, 1983, pp. 272-298.

[GILB83] Gilbreath, J., and Gilbreath, G., "Eratosthenes Revisited," Byte, January, 1983, pp. 283-326.

[HAGE82] Hagerman, John, "Evaluating Performance Tradeoffs Eases Winchester Selection", EDN, October 13, 1982, pp133-144.

[IAGN82] Iagnemmo, Al, "Microcomputers in the Land of Mainframes," Government Data Systems, September/October, 1982, pp.32-35.

[INFO83] "Future Technology Trends: 1983", Information Systems Planning Service, Research Memorandum, December 1982.

[JURG82] Jurgen, Ronald, "Our Computers aren't Speaking," IEEE Spectrum, September, 1982, pp. 62-65.

[KAYP83] Kay, Peg, and Patricia Powell, Editors, "Future Information Processing Technology," NBS Special Publication, 1983.

[KENE82] Kenealy, Patrick, "Database Software Packages for Micros," Micro Systems, September, 1982, pp. 193-202.

[KOTE82a] Kotelly, George, "EDN's Third Annual Microcomputer Operating Systems Directory," EDN, September 15, 1982, pp. 81-160.

[KOTE82b] Kotelly, George, "Local-area Networks: Part 1 - Technology; Part 2 - Low and Midrange Products; Part 3 - High-Performance Products," EDN, February 17, 1982, pp.109-150.

[LANG83] Langhorst, Fred E., and Thomas B. Clarkson, "Realizing Graphics Standards for Microcomputers," Byte, February, 1983, pp.256-268.

[LEIB82a] Leibson, Steve, "The Input/Output Primer Part 1: What is I/O?", Byte, February, 1982, pp. 122-146.

[LEIB82b] Leibson, Steve, "The Input/Output Primer Part 2: Interrupts and Direct Memory Access," Byte, March, 1982, pp. 126-140.

[LEIB82c] Leibson, Steve, "The Input/Output Primer Part 3: The Parellel and HPIB (IEEE-488) Interfaces," Byte, April, 1982, pp. 186-208.

[LEIB82d] Leibson, Steve, "The Input/Output Primer Part 4: The BCD and Serial Interfaces," Byte, May, 1982, pp. 202-220.

[LEIB82e] Leibson, Steve, "The Input/Output Primer Part 5: Character Codes," Byte, June, 1982, pp. 242- 258.

[MARK83] Markoff, J., and Shea, T., "Information Utilities," Infoworld, March 28, 1983, pp. 41-51.

[MCDE83] McDermott, Jim, "Personal Computer Engineering Add-ons and Add-ins," EDN, January 20, 1983, pp. 62-84.

[McGO83] McGonagle, John J. Jr., and McClain, Larry, "Negotiating Computer Contracts," Popular Computing, March, 1983, pp. 126-130.

[MIAS82a] Miastowski, Stan, "Memory Storage The Megabyte Way," Computers and Electronics, December, 1982, pp. 77-81.

[MIAS82b] Miastrowski, Stan, "Small Computer Printers: Evolution, Competition, and Innovation," Popular Computing, June, 1982, pp. 66-77.

[MOBE82] Moberg, D., and Laetsky, I., "Videodiscs and Optical Data Storage," Byte, June 1982, pp. 142-160.

[MOUL82] Moulton, P.D., "Balanced Computing," In Depth, September 20, 1982, pp. 25-32.

[RITC83] Ritchie, D.M., Thompson, K., "The UnixTm Time-Sharing System," Communications of the ACM, January, 1983, pp.85-90

[ROSE82] Rosenthal, Robert, "The selection of Local Area Computer Networks," NBS Special Publication 500-96, November 1982.

[SANT83] Santarelii, Mary-Beth, "Expert Forecasts Vary for 1983," Software News, January, 1983, pp. 15,22.

[SARI83] Sarisky, Larry, "Will Removable Hard Disks Replace the Floppy?," Byte, March, 1983, pp. 110-118.

[STRU83] Struck, Myron, "GSA Plans to Open Shop In Computer Business," Washington Post, March 22, 1983.

[TANN83] Tannenbaum, Michael and McClain, L., "The Pains of Implementation", Popular Computing, March 1983, pp. 38-44.

[TEJA82] Teja, Edward R., "Computers and Peripherals," EDN, December, 1982.

[TWAD82] Twaddell, William, "EDN's Ninth Annual Microprocessor/Microcomputer Chip Directory," EDN, October 27, 1982, pp. 99-204.

[WARR82] Warren, Carl, "Computers and Peripherals," EDN, July 16, 1982, pp.346-356.

[WILL82] Williams, Gregg, "A Graphics Primer," Byte, November, 1982, pp. 448-505.

[WHIT82] Whitaker, Lewis A., "Maintenance Alternatives for Personal Computers," Byte, June, 1982, pp. 452-459.

[WITT83] Witten, Ian H., "Welcome to the Standards Jungle," Byte, February, 1983, pp. 146-178.

[YOUN82] "Low Cost Computing Strategies," Arthur Young and Co. study conducted for the Department of Defense, 1982.

APPENDIX A

AGENCY CONTACTS

The following individuals (and their staffs) have graciously shared their time, insights, and opinions with respect to the potential and challenges presented by the microcomputer technology.

Francis Balint
Office of Information and Management Services
National Oceanic and Atmospheric Administration (DOC)
(301)443-8801

Thomas Byrne
Office of Policy and Review
Department of Labor
(202)523-9171

John Coffman
Administrative Computer Center
Department of Energy
(301)353-4623

Reginald Creighton
Office of Computer Services
Smithsonian Institution
(202)357-1596

Major Peter Donohue
Air Force Small Computer/Office Automation Service Organization
Air Force System Design Center
(205)279-3282

LTC Rodney Edge
Division of Biometrics
Walter Reed Army Institute of Research
U.S. Army Medical Research and Development Command
(202)576-2212

Frank Giannetti
Office of General Services, Marketing and Research Division
State of New York
(518)474-1915

Mike Gilbride
Office of Associate Managing Director for Information Management
Federal Communications Commission
(202)653-5720

Robert Green
Navy Data Automation Command
(202)433-4996

William Leary
Information Resources Management Systems
Office of the Assistant Secretery of Defense, Comptroller
Department of Defense
(202)695-3147

Rick McDonald
Computer Center Division, ADP Information Management Section
U.S. Geological Survey (DOI)
(703)860-7123

Roger Myers
Office of Information Resource Management
Department of Agriculture
(202)447-4437

John Severin
Micro/Mini Evaluation Team
Navy Regional Data Automation Command - Norfolk, Va.
(804)444-8486

APPENDIX B

INFORMATION SOURCES

There is an abundant amount of microcomputer information and activity being offered by professional organizations, universities, user groups, publishers, vendors, and computer stores. This appendix presents references to these organizations and their products. The intent is to provide pointers to existing and/or potential sources of microcomputer information and activity. No claim to exhaustiveness is made. The services and offerings listed in this appendix are available throughout the country. References to national or corporate sources are given whenever possible. Particular emphasis on the Washington D.C. area is made because of the concentration of Federal activities in this area.

Pointers to information are provided for the following areas:

Electronic Based Bulletin Boards (BBS)
Conferences, seminars, workshops, and/or classes
Consolidated references
Microcomputer magazines and periodicals
Telecomputing services
User groups and special interest groups (SIG)
Microcomputer Systems

Electronic Bulletin Boards (BBS)

Electronic bulletin board systems (BBS) offer the user the opportunity to exchange information and ideas with other users. Typically, a BBS will focus on a specific subject area or microcomputer system.

Due to the large number of BBSs and the volatile nature of phone numbers, only a few local BBSs are listed below. These BBSs can provide complete (and updated) lists of other local and long distance BBSs. This is NOT a complete list.

ICST Microcomputer Electronic Information Exchange
Gaithersburg, Md.
(301) 948-5718
Computer Performance Evaluation Users Group (CPEUG)
Sponsored and operated by ICST; Gaithersburg, Md.
(301) 948-5717
Hollywood RCP/M RBBS
(213) 653-6398
PSBBS; Washington, DC.
(202) 337-4694
Rickey Moose; Kensington, Md.
(301) 871-5370
Switch Board; Alexandria, Va.
(703) 765-2161
USGS R/CPM; Reston Va.
(703)471-1536
Wash Networks; Vienna, Va.
(703) 560-7803

NOTE

The ICST Microcomputer Electronic Information Exchange became operational on May 1, 1983. Access Instructions for this BBS system can be found in Appendix D.

Conferences, Seminars, Workshops, and Classes

The following organizations sponsor conferences, seminars, workshops and/or classes on microcomputer related topics.

AFIPS (NCC sponsor)
1815 N. Lynn Street
Arlington, Va. 22209
(703)558-3612

Association for Computing Machinery (ACM)
Washington D.C. Chapter
PO Box 6228
Washington, D.C. 20015
(202)296-42211

Continuing Engineering Education
The George Washington University
School of Engineering and Applied Science
Washington, D.C., 20052
(202)676-6106
(800)424-9773

Federal ADP Users Group (FADPUG)
Special Interest Group, Microcomputer Applications and Technology (SIGMAT)
USDA Graduate School
Washington D.C. 20024
(202)447-3247

Federal Education Programs (Federal Computer Conference sponsor)
PO Box 368
Wayland, Ma.
(617)358-5181

IEEE Computer Society
PO Box 639
Silver Spring, Md. 20901
(301)589-3386

Interface Group (Federal DP Expo sponsor)
160 Speen Street
PO Box 927
Framingham, Ma. 01701
(617)879-4502
(800)225-4620

Institute for Computer Sciences and Technology
Systems and Software Division
National Bureau of Standards
Washington D.C. 20234
(301) 921-3485

National Trade Productions, Inc. (Federal Office Systems Expo sponsor)
9418 Annapolis Road, Suite 206
Lanham, Md. 20706

Public Management Institute
George Mason University
Fairfax, Va.

Transfer Institute
741 10th Street
Santa Monica, Ca. 90402
(213)394-8305

U.S. Professional Development Institute
12611 Davan Drive
Silver Spring, Md. 20904
(301)445-4405

In addition to the sources above, the following generic organizations may offer classes on microcomputer topics.

Computer Vendors and Stores
Many computer vendors and stores conduct classes on the hardware and software products they sell. Possible sources of computer vendors and/or stores are the Yellow Pages phone book (under 'Computers'), the Datapro Directories, and the Auerbach Directories.

Educational Television
Microcomputer related programs and instruction may be offered by local television stations.

Graduate School of the USDA
The Graduate School offers day, evening, and Saturday classes. For information call (202)447-4419

End-user Interactive Training
Software vendors are beginning to write and include training packages for microcomputer systems and software. The packages usually consist of on-line computer-based training with diskettes and manuals. Three such vendors are American Training International, Open Systems, and Taurus Software Corp. Contact the local computer store for information on training package availability and vendors.

University and Adult Education Programs
Classes are available at universities, community colleges, and college, high school, and community adult education programs. The school registrar should be contacted for information on school offerings and schedules.

Telecomputing Services

Telecomputing networks give the user access (for a fee) to thousands of programs and data bases, as well as the ability to communicate electronically with other users. The major telecomputing services (subscription and user fees are imposed) are:

Dialog
3460 Millview Ave.
Palo Alto, Ca. 94304
(800)227-1960
Dialog is a bibliographic retrieval service with more than 170 available databases. Of particular interest are the International Software index, Magazine index, and Microcomputer index.

Dow Jones News/Retrieval
PO Box 300
Princeton, N.J. 08540
(800)222-0081
The News/Retrieval services include 20 data bases consisting of business and economic news, stock quotes, financial and investment services and general news and information services.

Newsnet
945 Haverford Road
Bryn Mawr, Pa. 19010
(800)345-1301
The Newsnet data base is a collection of newsletters from independent publishers. The newsletters cover information on telecommunications, electronics and computers, fiber optics, and satellite news.

New York Times Information Service
1719 A, Rte 10
Parsippany, N.J. 07054

The CompuServe Information Service
5000 Arlington Center Blvd.
Columbus, Oh. 43220
(800)848-4458
CompuServe offers four categories of service which includes the ability to download software, obtain business and financial information, and query a variety of data bases.

The Source (a Reader's Digest subsidiary)
1616 Anderson Rd.
McLean, Va. 22102
(703)821-6660
The Source currently offers a diverse group of services and data bases. An electronic mail feature is also available.

Microcomputer Users Groups and Special Interest Groups

USER GROUPS

Microcomputer users groups exist for all types of microcomputer systems. Often there is more than one group per system. Below are just a few of the users groups in the Washington D.C. area.

APPLE:
Name: Novapple
for information call: Dr. Theron Fuller
(703)370-5563 eves.

Name: Washington Apple Pi
for information call: (301)621-2719

ATARI:
Name: The Downtown Washington Atari Users Group
for information call: Frank Hoband
(202)357-7829

Name: Montgomery County Atari Computer Users Group
for information write: Jay Pollack
PO Box 961
Rockvill, Md. 20851

Name: Novatari Group
for information call: Paul Chapin
(703)476-5950 eves.

CP/M:
Name: Washington Metropolitan CP/M Users Group
for information call: Charlie Pilzer
(301)654-3815
Toby Riley
(301)986-1234

COMMODORE:
Name: CAPE-Capital Area PET Enthusiasts
for information write: Bob Karpen
2054 Eakins Court
Reston, Va. 22091

HEWLETT-PACKARD:
Name: HP Desk-Top Users Group
for information write: Washington Club,
Bruce Baxter,IRS-D:R:R:M
1111 Constitution Ave.
Washington D.C. 20224

IBM-PC:
Name: Capital PC Users Group Inc.
for information call: Mike Todd
(202)561-5187

OSBORNE:
Name: Washington Area Osborne Users Group
for information write: Michael Canyes
3117 Lancer Drive
Hyatsville, Md. 20782

TRS:
Name: The Northern Virginia TCUG (Tandy Computers Users Group)
for information write: Paul Ledford
Northern Virginia TCUG
PO Box 2826
Fairfax, Va. 22031
(301)899-2406

UNIX:
Name: Unix Users Group
for information write: Uni-ops
PO Box 5182
Walnut Creek, Ca. 94896
(415)933-8564
(this is an umbrella organization for Unix Users Groups)

ZENITH-HEATH:
Name: CHUG (Capital Heath Users Group)
for information write: CHUG
PO Box 2653
Fairfax, Va. 22031

SPECIAL INTEREST GROUPS

Federal ADP Users Group (FADPUG)
Special Interest Group on Microcomputer Applications and Technology (SIGMAT)
An organization of Federal employees involved with and interested in microcomputers.
for information call: Susan Campbell
(202)447-3247

Consolidated References

Consolidated or 'looseleaf' references are comprehensive sources of a wide range of information on ADP equipment, software, services and companies. Below are several of these references:

Auerbach Computer Technology Reports
Auerbach Publishers Inc.
6560 N. Park Drive
Pennsauken, N.J. 08109
(609)662-2070

Data Decisions Inc., Computer Systems
Ziff-Davis Publishing Co.
20 Brace Road
Cherry Hill, N.J. 08034
(609)429-7100

Datapro Directories
Datapro Research Corp.
1805 Underwood Blvd.
Delran, N.J. 08075
(609)764-0100
(301)589-6040 (Washington DC office)

Data Sources
Ziff Davis Publishing Co.
PO Box 5845
Cherry Hill, N.J. 08034
(609)795-7012

ICP Software Directory
International Computer Programs
9000 Keystone Crossing
PO Box 40946
Indianapolis, Ind. 46240
(317)844-7461

FADPUG SIGMAT: Microcomputer Source Book
John Belshe
ARMY Corps of Engineers
Room 7113 Pulaski Building
Washington, D.C. 20314
(202)272-0131

Software Catalog
Elsevier Science Publishing Co.,Inc.
52 Vanderbilt Ave.
New York, N.Y. 10017

Magazines and Periodicals

The magazines, journals, and newspapers listed below are considered primary sources for articles on microcomputers. They represent only a sample of the available sources of published microcomputer information. Microcomputer related articles also appear in the daily newspapers, and the popular and news magazines, but will not be listed here.

An indication as to the magazine type or microcomputer emphasis is given wherever applicable. If no description is given, the magazine publishes articles on all aspects of microcomputer hardware and software.

Byte
PO Box 590
Martinsville, N.J. 08836

Compute
(6502-based systems)
PO Box 5406
Greensboro, N.C. 27403

Computer World
(Newsweekly)
375 Cochituate Rd. Rte. 30
Framingham, Ma. 01701

Creative Computing
(Applications and software)
PO Box 789-M
Morristown, N.J. 07960

Dr Dobb's Journal
Box E 1263, El Camino Real
Menlo Park, Ca. 94025

80 Micro
(TRS-80)
PO Box 981
Farmingdale, N.Y. 11737

80-U.S. Journal
(TRS-80)
3838 South Warner St.
Tacoma, Wa. 98409

InfoWorld
(Newsweekly)
375 Cochituate Rd., Box 880
Framingham, Ma. 01701

Interface Age
(Business and home applications)
PO Box 1234
Cerritos, Ca. 90701

Micro
34 Chelmsford St.,
PO Box 6502
Chelmsford, Ma. 01824

Microcomputing
PO Box 997
Farmingdale, N.Y.

Microsystems
(CP/M user journal)
PO Box 1987
Morristown, N.J. 07960

Nibble
(APPLE computers)
BOX 325
Lincoln, Ma. 01773

PC Magazine
(IBM Personal Computers)
1239 21 Ave.
San Francisco, Ca. 94122

PC World
(IBM Personal Computers)
PO Box 6700
Bergenfield, N.J. 07621

Popular Computing
PO Box 307
Martinsville, N.J. 08836

'68 Micro Journal
5900 Cassandra Smith, PO Box 849
Hixson, Tn. 37343

Softside
(software for APPLE, ATARI,
IBM, TRS-80)
515 Abbott Dr.
Broomall, Pa. 19008

Personal Computing
4 Disk Dr. Box 13916
Philadelphia, Pa. 19101

The Rainbow
5803 Timber Ridge Dr.
Prospect, Ky 40059

Softalk
11021 Magnolia Blvd.
North Hollywood, Ca. 91601

Sync
(TIMEX/SINCLAIR)
PO Box 789-M
Morristown, N.J. 07960

Microcomputer Systems

The microcomputers listed below represent only a sample of the many available microcomputer systems. We have attempted to identify the more popular general purpose, professional, and/or portable systems. The computers are listed alphabetically and include the micro chip, the word size (8 or 16), and the operating system that is associated with the machine. The omission or inclusion of a particular microcomputer system does not imply criticism or endorsement by the National Bureau of Standards or the authors.

APPLE II+
Chip: CMOS 6502, 8 bit
Op S: Apple DOS

APPLE III
Chip: MOS 6502A, 8 bit
Op S: Apple SOS

ATARI 800
Chip: CMOS 6502, 8 bit
Op S: Atari OS

COMMODORE 64
Chip: MOS 6510, 8 bit
OP S: Commodore OS

COMMODORE VIC 20
Chip: MOS 6502A, 8 bit
Op S: Commodore DOS

COMPAQ
Chip: Intel 8088, 16 bit
Op S: MS-DOS

CORVUS CONCEPT
Chip: Motorola 68000, 16 bit
Op S: Merlin

CROMEMCO SYSTEM THREE
Chip: Zilog Z80, 8 bit
Op S: CP/M

DEC RAINBOW 100
Chip: Intel 8088, 16 bit; Zilog Z80, 8 bit
Op S: CP/M-86, CP/M-80

DEC PROFESSIONAL 350
Chip: Digital F11 (PDP 11/23); 16 bit
Op S: P/OS

DYNALOGIC HYPERION (portable)
Chip: Intel 8088, 16 bit
Op S: MS-DOS

EPSON HX-20 (portable)
Chip: CMOS 6301, 8 bit
Op S: EPSON OS

FORTUNE 32:16
Chip: Motorola 68000, 16 bit
Op S: Unix

FRANKLIN ACE 1000
Chip: MOS 6502, 8 bit
OP S: Apple DOS

GRID COMPASS (portable)
Chip: Intel 8086, 16 bit
Op S: Grid OS

HEATHKIT H89/Zenith Z89
Chip: Zilog Z80, 8 bit
OP S: HDOS, CP/M

IBM PC
Chip: Intel 8088, 16 bit
Op S: MS-DOS

INTERTEC SUPERBRAIN I
Chip: Zilog Z80, 8 bit
Op S: MS-DOS

LEXICON LEX-31 (portable)
Chip: NSC 800, 8 bit
Op S: Lexicon OS

MTU-130
Chip: CMOS 6502A, 8 bit
Op S: CODOS

NEC PC 8001
Chip: PD780C-1, 8 bit
Op S: CP/M

NORTH STAR ADVANTAGE
Chip: Zilog Z80A, 8 bit
Op S: Graphics CP/M

ONYX C8000
Chip: Z8000, 16 bit
Op S: ONIX

OSBORNE 1 (portable)
Chip: Zilog Z80A, 8 bit
Op S: CP/M

RADIO SHACK MODEL 16
Chip: ZILOG Z80A 8 bit; Motorola M68000
Op S: TRDOS-16, Zenix

TEXAS INSTRUMENTS PROFESSIONAL
Chip: Intel 8088, 16 bit
Op S: MS-DOS, CP/M-86, UCSD p-System

TIMEX SINCLAIR 1000
Chip: Zilog Z80A, 8 bit
Op S: Timex OS

TRS-80 MODEL III
Chip: Zilog Z80A, 8 bit
Op S: TRSDOS

VECTOR GRAPHIC 2800
Chip: Zilog Z80A 8 bit
Op S: CP/M

VICTOR 9000
Chip: Intel 8088, 16 bit
Op S: MS-DOS, CP/M

WANG PC
Chip: Intel 8086, 16 bit
Op S: MS-DOS

XEROX 820-II
Chip: Zilog Z80A, 8 bit
Op S: CP/M

APPENDIX C

AGENCY DOCUMENTS

The following is an annotated bibliography of the publications we have received from several of the participating agencies. The bibliography is arranged alphabetically by agency.

AIR FORCE DATA SYSTEMS DESIGN CENTER

Small Computer/Office Automation Service Organization
Gunter Air Force Station, Alabama

1. A FLOPPY DISK HANDBOOK: Care and Utilization of Diskettes

   This document is a general source of information about diskettes. Included are discussions on understanding diskettes, storing and handling, mailing, and traveling with diskettes, and the environmental constraints and maintenance procedures involved in diskette usage.

2. APPLE II TO H6000 CONNECTIVITY EVALUATION, July 1982;
   prepared by Command Level ADP Systems Management Division

   This report documents work performed to evaluate the ability of an APPLE II+ microcomputer system to function as a terminal and as a remote computer which is capable of exchanging data files with a HONEYWELL Series 6000 computer system.

3. "EVERYTHING YOU EVER WANTED TO KNOW ABOUT MICROCOMPUTERS" (But didn't know WHO to ask), June 1, 1982;
   by ETC Leland W. Slater

   Refer to NAVDAC reference below.

4. MICROCOMPUTER GUIDELINES, July 1, 982

   Guidelines for the selection of microcomputer systems within the U.S. Air Force are established in this document.

5. MICROCOMPUTER-TO-MICROCOMPUTER COMMUNICATIONS SOFTWARE, February 14, 1983

   The purpose of this letter and attachments is to familiarize the reader with the public domain programs available to implement microcomputer-to-microcomputer communications.

DEPARTMENT OF LABOR

1. AUTOMATED INFORMATION SYSTEMS STANDARDS, DLMS 9, September 1982

   The standards for Department of Labor microcomputers is established in this document, section 640.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Office of Information and Management Servies
(301)443-8113

1. NOAA ADMINISTRATIVE INFORMATION SYSTEMS POLICY AND GUIDELINES, July 26, 1982

   Policy and guidelines for microcomputer systems within NOAA are established in this document.

NAVAL DATA AUTOMATION COMMAND

NAVY REGIONAL DATA AUTOMATION CENTER
Norfolk, Virginia

1. DATA-BASE SYSTEMS AND MICRO-COMPUTERS: AN OVERVIEW, August 1979; by Michael Gagle, Gary Koehler, and Andrew Whinston

   The purpose of this article is to present the data base concepts

in the framework of an example and describe how an implementation would take place in the microcomputr environment.

2. "EVERYTHING YOU EVER WANTED TO KNOW ABOUT MICROCOMPUTERS" (But didn't know WHO to ask), June 1, 1982;
by LTC Leland W. Slater

An informal, but detailed look into current microcomputer technology, trends, standards, pitfalls, and recommendations.

3. Micro-computer Support, NAVDAC Advisory Bulletin No. 28, March 18, 1982

This bulletin contains a description of the microcomputer activities and support provided by NAVDAC-Norfolk.

4. NAVAL DATA AUTOMATION TECHNICAL STANDARDS: Microcomputer Hardware and Software Standards, NAVDAC PUB 17.7, September 1982

This standard addresses the various hardware and software factors that should be considered by Navy activities to ensure the selection of microcomputer systems that will satisfy the activity's requirements.

5. Projects, Technical Reports, and Software Evaluations;
by Micro Team, NARDAC, Norfolk

A list is given of the Micro Team's products: projects, reports, and evaluations.

6. SAMPLE LETTER TO VENDORS

This letter requests vendors to supply its product to the Microcomputer Evaluation Team for evaluation.

7. SMALL COMPUTER GUIDELINE: Acquisition and Management of Small Computers

Guidelines for the acquisition and management of small computers within the Navy's non-tactical automatic data processing environment.

8. Technical Evaluation and Recommendation for Procurement of Microcomputer Systems, Technical Report UNF2100M, October 6, 1981;
by DPC Byron Williams

This report provides technical advice concerning the feasibility of procuring microcomputers at the Naval Base Civilian Personnel Office (NBCPO). Specific hardware and software configurations and packages are discussed and recommended.

9. Technical Evaluation and Recommendation for Procurement of Microcomputer system, Technical Report UNP9200H, January 1982;
by John Severin

This report provides technical advice concerning the selection of hardware and software needed to satisfy current and future requirements of the Commander Naval Construction Battatlion. Specific hardware and software configurations are discussed and recommended.

SMITHSONIAN INSTITUTION

Office of Computer Services

1. A GUIDE TO COMPUTATION AT THE SMITHSONIAN INSTITUTION, PART I: RESOURCES, Procedures in Computer Sciences, Vol II Num. 1, June 1981;
Compiled and Edited by Reginald Creighton

   The guide provides information of particular use to the person new to computer services at the Smithsonian. Part I of the guide (Resources) describes the types of computer hardware, software, and services available at the Smithsonian.

2. A GUIDE TO COMPUTATION AT THE SMITHSONIAN INSTITUTION, PART II: PROCEDURES, Procedures in computer Sciences, Vol II Num. 2, October 1981;
Compiled and Edited by Reginald Creighton

   The guide provides information of particular use to the person new to computer services at the Smithsonian. Part II of the guide (Procedures) describes how to use the Smithsonian's computer resources. A section on microcomputer and telecommunication equipment standards is included.

STATE OF NEW YORK

Office of General Services

1. DRAFT: MICROCOMPUTER ACQUISITION, Budget Policy and Reporting Manual, September 1982

   The acquisition requests for microcomputers, peripheral equipment, and software is processed by the Office of General Services (OGS). A description of the hardware, software and related technical assistance available to requesting agencies is presented.

2. EXECUTIVE SUMMARY: Centralized Acquisistion of Micro-computers

   This report defines the objectives of the centralized acquisition of microcomputers and the alternatives to accomplish these objectives.

3. MICROCOMPUTER SYSTEMS: Group Specification, SPEC-833 dated February 3, 1982

   A copy of the specification describing the microcomputer systems to be furnished to the NYS Office of General Services. Included are detailed specifications for: an educationally oriented system, a business oriented system with 5-1/4" and a system with 8" drives, and a multi-user business oriented system.

4. MICROCOMPUTER SYSTEMS: Notice of Contract Award for proposal 3643, date of issue: June 17, 1982

   A copy of the microcomputer systems contract award, including contract conditions, contractors, and item descriptions and price.

5. Office of General Services Computer Center: MICROCOMPUTER NEEDS ASSESSMENT FORM

   A copy of the form used by the OGS Micro Computer Unit to assist agencies in acquiring the best possible microcomputer for its needs.

U. S. DEPARTMENT OF AGRICULTURE
Special Programs Office

1. MICROCOMPUTER CHARACTERISTICS, July 1982;
   issued by USDA Graduate School

   This document provides basic information which can be used to evaluate and select a microcomputer. It contains a description of twelve microcomputer characteristics and a review of twenty-nine models of microcomputers.

U.S. GEOLOGICAL SURVEY

Computer Center Division

1. ASYNCHRONOUS COMMUNICATION/FILE TRANSFER USING GSCOM

   This document provides instruction on the use of the asynchronous communications/file transfer program, GSCOM.

2. MICROCOMPUTER SOFTWARE: Commercially-Available Packages Running under CP/M

   An analysis/explanation of software packages available at the Survey is presented.

3. SUPERBRAIN USERS HANDBOOK, First Edition, November 16, 1981; prepared by: Mary O. Jones, Roy W. Anderson, and E. J. McFaul

   This handbook defines the basic procedures for using the INTERTEC SUPERBRAIN video computer system in terms that will enhance the new users ability to "get going."

4. USING SELECTOR-V on the INTERTEC SUPERBRAIN

   This document presents a quick introduction to the use of the SELECTOR-V data base management system for the INTERTEC SUPERBRAIN (or COMPUSTAR) microcomputer.

APPENDIX D

ICST MICROCOMPUTER ELECTRONIC INFORMATION EXCHANGE

ACCESS INSTRUCTIONS

ACCESS INSTRUCTIONS FOR THE

ICST Microcomputer Electronic Information Exchange

The system is available 24 hours a day, 7 days a week. If a connection is not established at the end of two rings or if the line is busy, hang up and try again.

To connect to the bulletin board the procedure is as follows:

1. You must have a standard ASCII terminal or computer to use the bulletin board. Set your terminal (or computer communications) to:
   300 Baud (A 1200 Baud option is planned for the near future)
   8 Data Bits
   No Parity
   1 Stop Bit

2. Dial (301) 948-5718 if outside the local calling area or 948-5718 if within the D. C. Metropolitian Area.

3. The bulletin board should start immediately after the connection is established. No pre-established accounts are required to use the bulletin board.

4. A menu of options will be displayed by the board. Simply hit the number (0-5) corresponding to the option desired (no carriage return is required). First time users should enter 0 to obtain additional information about the bulletin board. (If the menu options are merely reprinted without any other action occurring, the setup in (1) above is probably incorrect. Try setting up the terminal again. Some terminals require that the power be turned off for a few seconds and then turned on again with the new settings. Likewise, some computers need to be rebooted with the new software settings.)

5. On this bulletin board, which is actually a Remote CP/M (RCP/M) bulletin board, file transfers can be performed via public domain modem protocols as they become available. However, if file transfer is to be accomplished, then you must use a computer as your terminal with a working copy of a protocol available on the bulletin board.

   (At this writing XMODEM is available for file transfer. XMODEM is an implementation of Ward Christenson's MODEM2 modem software).

6. Good Luck.

   (If all else fails, call (301) 921-3485 and ask someone for the Microcomputer Electronic Information Exchange System Operator).

APPENDIX E

COMPLETED QUESTIONAIRES

U.S. Department of Agriculture

Interview with Roger Myers from the Office of Information Resource Management (OIRM) of Department of Agriculture

The Department of Agriculture consists of 20 subordinate agencies, plus many field installations. An ad hoc intra-agency (USDA) ADP Micro Policy Committee recommended general policies and procedures for OIRM and the field installations, but detailed administration of these policies is decentralized.

A. Policy, Management, and Administration

1. Does your agency distinguish among micros, minis, and large general purpose computers? If so, how?

   Policies have been developed to distinquish microcomputers from other ADP equipment.

2. Who (person, position, organization) has overall responsibility for micros?

   The OIRM has responsiblity. The ADP Micro Policy committee (consisting of representatives from the subordinate agencies developed and recommended microcomputer policies under OIRM leadership.

3. What policies (implicit and explicit), regulations, directives are operative with regard to micros?

   There is an explicit policy regarding microcomputers, although caution is exercised to prevent the inhibition of creativity through over-management. The use of microcomputers and off-the-shelf software, is encouraged. A need for microcomputers

standards (e.g. operating systems, communications, etc.) is recognized.

4. Does the degree of control exercised over micros reflect a considered approach or one that's just evolved?

Control is the result of a considered approach.

5. Are micros treated differently than other comparably priced resources (e.g., lab equipment)?

Yes. The policy for microcomputers excludes laboratory equipment.

6. To what extent are the sequence and pace with which applications are introduced, controlled by higher level management?

The sequence and pace is consistent with department (OIRM) policy and guidance, and is controlled by the subordinate agencies which in turn, affect the field installation management.

B. Current environment/experience

1. What generic hardware and software are currently supported by microcomputers?

Generic applications include word processing, electronic spread sheet, DBMS systems, as well as publishing documents, and Green-Thumb - market information to farmers; communications is being used extensively.
Hardware includes: over 500 microcomputers with some connected to photocopy and communications equipment.

2. What telecommunications facilities are used to interconnect the micros and what type of interconnections are made?

Extensive use is being made of electronic mail. Use of a microwave dish for telecommunication facilities as well as a packet-switched network is being examined. It is believed that Local Area Nets (LAN) are an extremely important area and offer large cost savings and the potential for sharing resources (printers, hard disks).

3. What is the degree to which systems h/w and s/w are compatible/ transportable and can "talk" with one another?

Microcomputers are "talking" to the main frame and to other microcomputers. However, it is recognized that more work is required to effectively interface microcomputers with main frame computers.

4. To what degree is use of off-the-shelf vs. specially developed systems and software encouraged?

Off-the-shelf software packages are highly encouraged and used extensively.

5. What has been the method by which you have identified and evaluated microcomputer h/w and s/w? What have been the specific features that you have looked for in specific application programs?

Agriculture has identified and evaluated microcomputer hardware and software from literature, vendor visits and broshures, and computer stores. Currently, some micro system evaluations are being performed by OIRM. .le;What application packages are being used including utilities and DBMS's?

A variety of packages and utilities are being used.

6. To what degree are development, procurement, support and maintenance centralized?

Agriculture is a very decentralized agency. However, arrangements with vendors for volume discounts of hardware and/or software is being negotiated.
OIRM, in Washington, D.C., provides information to the subordinate agencies (and field offices) on the selection of appropriate microcomputer systems.

7. What is the adequacy of vendor provided maintenance and support?

Vendor support has not had to be faced to any great extent. Maintenance is handled on an individual (no agency-wide contract) basis with the vendor.

8. What microcomputer operating system and languages are used/preferred?

A CP/M compatible operating system is preferred. MSDOS, UNIX, and p-System operating systems are approved variances. COBOL, FORTRAN, BASIC, and DBMS are also used. A BASIC language standard for micros is wanted.

9. Are outside (videotex) information utilities accessed? Which ones? Extent of Use?

Videotext utilities are currently accessed including PBS and Green Thumb. There is also widespread use of electronic mail.

10. To what degree are programs and files shared among different users?

The amount of file and program sharing is believed to be considerable.

11. What problems have you encountered or do you foresee with regard to limitation on multiple uses of proprietary s/w? Is your agency attempting to deal with this contractually?

Volume discounts are being obtained for proprietary software.

12. What levels of growth do you foresee over the next five years with respect to numbers of users and types of users and numbers and types of equipment for your organization?

The numbers of microcomputers in the USDA is expected to grow to over 10,000 in the next five years.

C. People, Political, and Other Considerations

1. What provisions have you made with regard to staffing and training to facilitate the introduction, acceptance, and use of micros?

OIRM provides a centralized office for gathering and disseminating information about microcomputer systems. A general seminar is presented periodically. Arrangements are made to demonstrate vendor hardware and software to Department personnel. The USDA Graduate School Technical Center has been established as a training vehicle.

2. What unique personnel problems do you foresee with the infusion of microcomputers?

3. What unique political/organizational problems do you foresee with the growing availability and use of micros?

4. Do you anticipate any major changes in the physical work environment due to a major introduction of micros?

Changes in the physical work environment will be evidenced by the quantities of microcomputers introduced into the office.

5. Who has been the most agressive in the introduction of micros - ADP or the user community?

The users have been more aggressive, although the mini-computer ADP groups are being augmented with microcomputers. These efforts are supported by the subordinate agencies.

6. How have the issues related to micros differed for ADP and the user community?

Management and users are concerned with the connectivity and compatibility of micros and networks. Management is more aware of the lack of microcomputer system standards.

D. Other Contacts/ References

1. Have any sources of information/expertise been particularly valuable? If yes, which ones?

Magazines, newspaper periodicals (Infoworld, Computerworld), peer groups, and contacts external to the Department are excellent resources. Information has also been obtained from vendors and local computer stores.

Department of Energy

Interview with John Coffman, a staff member in the Office of Computer Services and Telecommunication Management (CSTM) which operates the Headquarters Administrative Computer Center located in Germantown, Maryland.

The Administrative Computer Center within the Department of Energy (DOE) is responsible for the planning, development, procurement and management of ADP equipment within DOE Headquarters.

A. Policy, Management, and Administration

1. Does your agency distinguish among micros, minis, and large general purpose computers? If so, how?

The process governing MIS development is well-defined. Central control resides with CSTM. System development follows the life-cycle process described in FIPS 38 and 64. For Office Automation, management and control is also centralized within CSTM. The process to document user requirements and formulate an OA solution is covered in the answers to the next questions.

2. Who (person, position, organization) has overall responsibility for micros?

CSTM is the governing body on OA management for DOE Headquarters.

3. What policies (implicit and explicit), regulations, directives are operative with regard to micros?

There are three major activities currently underway. First, a Headquarters Notice entitled, "Automated Office Support Management" has been developed and is with the Director for Administration for signature. Second, a task force has been established to address total Headquarters needs and develop a procurement vehicle to facilitate acquisition of OA equipment. Lastly, a Headquarters users group for OA is being established.

4. Does the degree of control exercised over micros reflect a considered approach or one that's just evolved?

Evolving approach. The organizational placement of microcomputer control is in the process of being established. As previously stated, management control for OA at HQ DOE rests with CSTM.

5. Are micros treated differently than other comparably priced resources (e.g., lab equipment)?

At Headquarters, there is no lab equipment being purchased. Although microcomputers are procured by the terminal administration organization, they are treated as other ADP equipment and not as typewriters or terminals.

6. To what extent are the sequence and pace with which applications are introduced, controlled by higher level management?

The sequence and pace with which applications are introduced is controlled entirely by higher level management and is technology driven.

B. Current environment/experience

1. What generic hardware and software are currently available and supported by microcomputers?

Current applications include spreadsheet analysis, database, and word processing. Action tracking and electronic mail applications will be added. All software is CP/M compatible.
Hardware includes several GNATs, Superbrains, IBM PC's, TRS-80s, Molecular Computer Systems, and Apples.

2. What telecommunications facilities are used to interconnect the micros and what type of interconnections are made?

Telecommunications capability is via telephone lines and twisted pair. The Molecular System supports 32 concurrent users via twisted pair cables and 9600 baud telephone lines.

3. What is the degree to which systems h/w and s/w are compatible/ transportable and can "talk" with one another?

Intramicrocomputer communication is very common, (e.g. the GNATs talk to each other as ACSII terminals). Interdevice communication is an important consideration and will continue to be encouraged. Inter-microcomputer commmunication is limited. GNATS and Molecular System (both CP/M) exchange files.

4. To what degree is use of off-the-shelf vs. specially developed systems and software encouraged?

The use of off-the-shelf software is encouraged. Customization and limited software development may be supported in

the future.

5. What has been the method by which you have identified and evaluated microcomputer h/w and s/w? What have been the specific features that you have looked for in specific application programs?

Evaluation criteria and formal procedures have been developed. A formal project to evaluate microcomputer hardware and software, and to report the findings has been established.

6. What application packages are being used including utilities and DBMS's?

Application packages being used include: WORDSTAR, SPELLGARD, SUPERCALC, VISICALC, -PLAN, -TREND, DBASEII, and PLAN 80. MULTIPLAN is currently under review.

7. To what degree are development, procurement, support and maintenance centralized?

Development, procurement, support, and maintenance are highly centralized. Maintenance is handled by an on-site contractor and is primarily component repair or replacement.

8. What is the adequacy of vendor provided maintenance and support?

Vendor support is generally very good with on-site support personnel required to restore service within two hours of the reported outage.

9. What microcomputer operating system and languages are used/preferred?

The microcomputer operating systems used are CP/M, MSDOS, and Tandy/Apple proprietary. The language currently used is BASIC.

10. Are outside (videotex) information utilities accessed? Which ones? Extent of Use?

No outside information utilities are being accessed on the microcomputers, although several are being accessed via the mainframes.

11. To what degree are programs and files shared among different users?

To the degree required, as determined by the analysis of each

user's requirements.

12. What problems have you encountered or do you foresee with regard to limitation on multiple uses of proprietary s/w? Is your agency attempting to deal with this contractually?

We are currently investigating the implementation of user's fees to deal with control problems associated with use of software and to deal equitably with the vendors.

13. What levels of growth do you foresee over the next five years with respect to numbers of users and types of users and numbers and types of equipment for your organization?

The numbers and types of users are expected to grow rapidly over the next five years. As mentioned earlier, a formal project has been established which will deal with the convergence of micro and office automation technologies resulting in extensive growth in the next five years.

C. People, Political, and Other Considerations

1. What provisions have you made with regard to staffing and training to facilitate the introduction, acceptance, and use of micros?

A training facility is available to enable users to gain experience with the microcomputer hardware and software. Classes and tutorial instruction are available. The microcomputer technology staff (under the Terminal Administration Program) maintains a telephone hotline. A formal support center and a centralized problem file are in the developmental stages.

2. What unique personnel problems do you foresee with the infusion of microcomputers?

These potential problems are to be addressed through the implementation of an OA Users Group. Personnel (especially secretaries) want jobs to be reclassified to reflect microcomputer skills.

3. What unique political/organizational problems do you foresee with the growing availability and use of micros?

The possible political/organizational problems have not yet been considered.

4. Do you anticipate any major changes in the physical work environment due to a major introduction of micros?

   Changes are anticipated, but cannot be identified at present.

5. Who has been the most agressive in the introduction of micros - ADP or the user community?

   Both have been aggressive. ADP tries to address all bona fide user requirements through the implementation of either MIS, OA systems or combination.

6. How have the issues related to micros differed for ADP and the user community?

   Users view microcomputers functionally, whereas ADP personnel are also concerned with cost and compatibility with other ADP equipments.

D. Other Contacts/ References

1. Have any sources of information/expertise been particularly valuable? If yes, which ones?

   The DEC "how to" books (i.e., "how to buy a Personal Computer") have been very informative.

Federal Communications Commission

Interview with Mike Gilbride, a staff member of the Office of Associate Manageing Director for Information Management

The Office of the Associate Managing Director for Information Management is one of six directorates within the Federal Communications Commission (FCC). It is concerned with establishing and managing the policy and procedures for all ADP aquisitions and use throughout the FCC.

A. Policy, Management, and Administration

1. Does your agency distinguish among micros, minis, and large general purpose computers? If so, how?

The FCC finds it difficult to distinguish between microcomputers, minicomputers, and large general purpose computers. Any distinction that is made is due to federal procurement regulations, not FCC regulations.

2. Who (person, position, organization) has overall responsibility for micros?

The Associate Managing Director has overall responsibility for microcomputers.

3. What policies (implicit and explicit), regulations, directives are operative with regard to micros?

The FCC has no written policies regarding micros. Implicitly, however, there are several policies. All micros must be capable of running the UNIX operating system, be shared by all personnel and not used as personal machines, and all must be centrally procured and independently cost justified. Additionally, all microcomputers must use Winchester fixed disks (no floppy disks allowed) and have a magnetic tape archiving capability.

4. Does the degree of control exercised over micros reflect a considered approach or one that's just evolved?

Considered approach. The use of microcomputers has come about as a result of the requirements for a FCC Local Area Network (LAN) and the desire to make available centrally developed and maintained data bases.

5. Are micros treated differently than other comparably priced resources (e.g., lab equipment)?

Microcomputers are ADP devices and are treated in the same manner as other ADP equipment (computers).

6. To what extent are the sequence and pace with which applications are introduced, controlled by higher level management?

The sequence and pace are completely controlled by higher level management. The microcomputers are part of the overall master plan for its LAN and have been closely monitored.

B. Current environment/experience

1. 1. What generic hardware and software are currently available and supported by microcomputers.

Generic applications include: management by objectives (MBO), personnel action tracking, data entry, spreadsheets, and word processing.

There are approximately 31 multiuser systems, all with fixed disks and archiving capability. The hardware includes ONYX (16-bit) and Zilog microcomputers, and several stand-alone word processing units.

2. What telecommunications facilities are used to interconnect the micros and what type of interconnections are made?

The FCC is developing and installing an Ethernet LAN to interconnect the microcomputers.

3. What is the degree to which systems h/w and s/w are compatible/ transportable and can "talk" with one another?

All software that is run under the UNIX operating system is compatible. However, the archiving tapes are not transportable.

4. To what degree is use of off-the-shelf vs. specially developed systems and software encouraged?

Most software consists of off-the-shelf packages which have been customized. The FCC has developed some software, but doesn't have the resources to do much in-house development.

5. What has been the method by which you have identified and evaluated microcomputer h/w and s/w? What have been the specific features that you have looked for in specific application programs?

Microcomputer hardware and software must operate under the UNIX operating system. Software packages are identified and evaluated by members of the Management Division staff and/or a sample of potential users (ie: a few selected wp packages were evaluated by several secretaries).

6. What application packages are being used including utilities and DBMS's?

Utilities include: a customized relational data base (INFORMIX), a user-friendly, menu driven interface to UNIX, and various software packages to support the applications listed in B1.

7. To what degree are development, procurement, support and maintenance centralized?

Development, procurement, support, and maintenance are centralized through the Management Division.

8. What is the adequacy of vendor provided maintenance and support?

The FCC has a maintenance contract for its microcomputers. Several problems have been encountered: one contractor (vendor supplied maintenance) had problems getting spare parts, the following contractor lacked expertise. A new maintenance contract has been negotiated and is in place for FY83. No problems have been encountered with the Zilog machine.

In retrospect, the FCC would try to anticipate maintenance requirements and keep its own spare parts and/or backup machines.

9. What microcomputer operating system and languages are used/preferred?

All microcomputers use the UNIX operating system. C is the used/preferred language. Several COBOL compilers are being evaluated and will be used for some applications.

10. Are outside (videotex) information utilities accessed? Which ones? Extent of Use?

Lexis, legal retrieval system, is the only outside information utility accessed.

11. To what degree are programs and files shared among different users?

There is very little sharing of files at this time. (The FCC is organized functionally and has little need to share files). However, the LAN will provide a file sharing capability.

12. What problems have you encountered or do you foresee with regard to limitation on multiple uses of proprietary s/w? Is your agency attempting to deal with this contractually?

Licenses are obtained for all copies of proprietary software. They would like to see GSA negotiate a multiple copy/lower price agreement with vendors and manufacturers.

13. What levels of growth do you foresee over the next five years with respect to numbers of users and types of users and numbers and types of equipment for your organization?

Question not addressed.

C. People, Political, and Other Considerations

1. What provisions have you made with regard to staffing and training to facilitate the introduction, acceptance, and use of micros?

The Management Division conducts a one day seminar on systems adminstration, provides user training and manuals, and staff members are available to answer questions. Users are given any assistance necessary to become acquainted with the LAN and the microcomputers.

2. What unique personnel problems do you foresee with the infusion of microcomputers?

No unique personnel problems are foreseen. The problems that might occur are the same as with implementing any computer system (ie: hiring and keeping qualified personnel and operating the computers).

3. What unique political/organizational problems do you foresee with the growing availability and use of micros?

No unique political or organizational problems are foreseen.

4. Do you anticipate any major changes in the physical work environment due to a major introduction of micros?

No changes in the work environment due to microcomputers are anticipated. Although, the automation process may create minor changes in office layout and communication lines.

5. Who has been the most agressive in the introduction of micros - ADP or user community?

Management

6. How have the issues related to micros differed for ADP and the user community?

The issues have not differed between ADP and user community. The users follow the direction provided by ADP management.

D. Other Contacts/ References

1. Have any sources of information/expertise been particularly valuable? If yes, which ones?

Question not addressed.

U.S. Geological Survey

Interview with Rick McDonald, manager of the ADP Information Management Section within the Computer Center Division

The Computer Center Division within the U.S. Geological Survey (USGS) is responsible for the planning, development and implementation of microcomputer-based office automation systems as well as other ADP equipments.

A. Policy, Management, and Administration

1. Does your agency distinguish among micros, minis, and large general purpose computers? If so, how?

Some distinction is made between microcomputers, minicomputers and large general pupose computers. There is a separate policy for microcomputers that speaks to mandatory requirements.

2. Who (person, position, organization) has overall responsibility for micros?

Computer Center Division is responsible for the planning, development, and implementation of microcomputer systems.

3. What policies (implicit and explicit), regulations, directives are operative with regard to micros?

Assistance with microcomputer problems will be available to those users who conform to USGS microcomputer requirement guidances.

4. Does the degree of control exercised over micros reflect a considered approach or one that's just evolved?

The degree of control reflects a considered and planned approach. The amount of control is subtle; hardware or software not conforming to the guidelines will probably not be supported. Therefore, it is to the benefit of the users to follow the recommended hardware and software guidlines.

5. Are micros treated differently than other comparably priced resources (e.g., lab equipment)?

Until recently, microcomputers were not treated differently than other comparably priced resources. A microcomputer requirements document is being developed.

6. To what extent are the sequence and pace with which applications are introduced, controlled by higher level management?

The sequence and pace is controlled by the ADP group, as a way of encouraging the scientists to use the micro technolgy.

B. Current environment/experience

1. What generic hardware and software are currently available and supported by microcomputers?

Generic applications include: word processing, electronic spreadsheets, data entry, DBMS, documentation control, telecommunications, and project management, as well as various scientific applications.
USGS uses Superbrain (8 bit, with minimum 64K RAM) microcomputers. Additional peripherals include plotters and low and medium speed matrix printers.

2. What telecommunications facilities are used to interconnect the micros and what type of interconnections are made?

Two software packages, GSCOM and RCP/M are available. GSCOM, a MODEM-7 based package enables communication between a microcomputer and the mainframe computers and/or other microcomputers. RCP/M is an electronic bulletin board software package and a method to exchange software. Additionally, a microcomputer can emmulate a RJE station (IBM BSC capability) using the BISYNC-80 package.

3. What is the degree to which systems h/w and s/w are compatible/transportable and can "talk" with one another?

Systems are highly compatible/transportable. Hardware systems consist of one type of microcomputer with compatible peripherals. GSCOM makes it possible for microcomputers to "talk" with each other.

4. To what degree is use of off-the-shelf vs. specially developed systems and software encouraged?

Off-the-shelf systems and software are highly encouraged. Several software packages have been developed in-house, and are available via the software exchange - RCP/M.

5. What has been the method by which you have identified and evaluated microcomputer h/w and s/w? What have been the specific features that you have looked for in specific application programs?

Question not addressed

6. What application packages are being used including utilities and DBMS's?

All software is CP/M compatible. Application packages currently being used include: an editor, WORDSTAR; spelling and grammer checkers, The WORD and GRAMMETIK; a DBMS, SELECTOR-V; telecommunications, GSCOM, RCP/M, and BISYNC-80; spreadsheet, PLAN-80; and project management, MILESTONE.

7. To what degree are development, procurement, support and maintenance centralized?

Procurement, development, support, and maintenance are highly centralized. Current efforts are underway to complete a mandatory requirements document.

8. What is the adequacy of vendor provided maintenance and support?

Question not addressed.

9. What microcomputer operating system and languages are used/preferred?

The CP/M operating system is used and encouraged. Languages include: BASIC, FORTRAN and COBOL.

10. Are outside (videotex) information utilities accessed? Which ones? Extent of Use?

Various Electronic Bulletin Board Systems (BBS) are accessed.

11. To what degree are programs and files shared among different users?

There is a remarkable degree of program and file sharing between users. The telecommunication facilities, software exchange, and ISD support provide the means for users to share information, data, and programs.

12. What problems have you encountered or do you foresee with regard to limitation on multiple uses of proprietary s/w? Is your agency attempting to deal with this contractually?

The illegal use of licensed software is discouraged. Vendor discounts are obtained whenever possible.

13. What levels of growth do you foresee over the next five years with respect to numbers of users and types of users and numbers and types of equipment for your organization?

USGS is conducting a worldwide agency survey to determine the needs and growth of microcomputer systems within the USGS.

C. People, Political, and Other Considerations

1. What provisions have you made with regard to staffing and training to facilitate the introduction, acceptance, and use of micros?

USGS is undergoing a reorganization to more closely align the microcomputer efforts with the needs. Training, manuals and support are provided by the ISD.

2. What unique personnel problems do you foresee with the infusion of microcomputers?

The staff assigned to mini- and mainframe computers will need to be retrained.

3. What unique political/organizational problems do you foresee with the growing availability and use of micros?

Some applications originally programmed for the larger computers could be adapted (for efficiency) to microcomputers. The redirection of the application to microcomputers may cause some problems.

4. Do you anticipate any major changes in the physical work environment due to a major introduction of micros?

Question not addressed.

5. Who has been the most agressive in the introduction of micros - ADP or the user community?

Question not addressed.

6. How have the issues related to micros differed for ADP and the user community?

Question not addressed.

D. Other Contacts/ References

1. Have any sources of information/expertise been particularly valuable? If yes, which ones?

Electronic Bulletin Board Systems (EBBS) are valuable sources of information. This free exchange of information, programs, and software has increased their microcomptuer awareness as well as software inventory.

Air Force System Design Center

Interview with Major Peter Donohue, Chief of the Air Force Small Computer/Office Automation Service Organization (AFSCOASO)

AFSCOASO is part of the Air Force System Design Center (AFSDC) at Gunter AFB AL. It is the centralization of expertise for small computer assistance for the Air Force. Its goal is to maintain and transport information, data, and software for microcomputers.

A. Policy, Management, and Administration

1. Does your agency distinguish among micros, minis, and large general purpose computers? If so, how?

There is no distinction made between microcomputers, minicomputers, except in terms of cost, required physical environment, and user processing tim available.

2. Who (person, position, organization) has overall responsibility for micros?

AFSCOASO received its authority in May 1982, and has overall responsibility for microcomputers. Each Air Command has its own technical service center with responsibilities for procurement and support of microcomputers within its command.

3. What policies (implicit and explicit), regulations, directives are operative with regard to micros?

Microcomputers must be justified and purchased under the appropriate ADP procurement regulations and policies. In addition, AFSCOASO has written several guidance documents: Microcomputer Guidelines, Diskette Handbook, OA Survey, and example RFPs. Other documents are forthcomming.

The microcomputer defacto industry standards are recommended and encouraged (CP/M, Z80, S-100 bus, 8" floppy). Major air commands are encouraged to use the defacto standards to ensure rapid AFSCOASO support.

4. Does the degree of control exercised over micros reflect a considered approach or one that's just evolved?

A considered approach, demonstrated by the advanced planning required to establish the AFSCOASO.

5. Are micros treated differently than other comparably priced resources (e.g., lab equipment)?

Microcomputers are treated in the same manner as other ADP devices.

6. To what extent are the sequence and pace with which applications are introduced, controlled by higher level management?

The sequence and pace are controlled by the ADP management structure. However, control is not meant to hinder the introduction of applications. Control is obtained by providing functional areas with services that they require. Control then provides for increased software portability by providing a customer service which is in demand.

B. Current environment/experience

1. What generic hardware and software are currently available and supported by microcomputers?

Applications range from generic utilites such as word processing; electronic spreadsheet; and DBMS; to specific applications of the Air Force.

Hardware includes various equipment (Apple, Cromemco, TRS-80), all with the following minimum configuration

one 8-bit processor
64K bytes of RAM
one terminal with a 24 line x 80 character display

2. What telecommunications facilities are used to interconnect the micros and what type of interconnections are made?

Telecommunications facilities are being developed. A local area network (LAN) is being installed and will connect AFSCOASO microcomputers with various host processors. Dual cable, wideband communication is being used. Also, being explored are interface protocols and the communications package, MODEM 7.

3. What is the degree to which systems h/w and s/w are compatible/ transportable and can "talk" with one another?

One of the primary concerns of AFSCOASO is to promote the transportability of information, data and software. The use of CP/M compatible software and 8" single-sided, single density, CP/M formatted, soft sectored floppy disks has enabled software to be taken from machine to machine or vendor to vendor.

4. To what degree is use of off-the-shelf vs. specially developed systems and software encouraged?

Off-the-shelf software packages are highly encouraged. Customization and limited software development are done (within the AFSCOASO and other AF commands) and made available through an on-line software exchange facility called Dial-A-Log.

5. What has been the method by which you have identified and evaluated microcomputer h/w and s/w? What have been the specific features that you have looked for in specific application programs?

AFSCOASO as a center of expertise within the Air Force, evaluates all hardware and software that will or is currently being used. Hardware and software used within the Air Force is identified, acquired, and evaluated. AFSCOASO produces guidelines, evaluations, specifications, surveys, etc., on microcomputer systems, hardware, and software.

6. What application packages are being used including utilities and DBMS's?

Almost everything that is available on the commercial market. CP/M compatible software is suggested.

7. To what degree are development, procurement, support and maintenance centralized?

AFSCOASO provides centralized development, procurement, and support for the Air Force with respect to microcomputers. Also, every major air command has a small computer technical center that procures and supports microcomputers.

A tri-service (Air Force, Army, Navy) procurement agreement for microcomputer hardware and software is being developed. Arrangements with vendors for volume discounts have been and are being discussed.

It is recommended that the major air commands establish a maintenance contract with the vendor from whom the microcomputers are purchased or arrange for repairs on a per call basis. There is no centralized maintenance program.

8. What is the adequacy of vendor provided maintenance and support?

The major air commands should arrange maintenance contracts locally (see above answer). Users are encouraged to buy an extra microcomputer (buy 51, if you need 50) to enable replacement of the system during repair.

9. What microcomputer operating system and languages are used/preferred?

CP/M operating system with a transient program area of not less than 56K bytes is encouraged. Available languages include: Pascal, COBOL, FORTRAN, and BASIC.

10. Are outside (videotex) information utilities accessed? Which ones? Extent of Use?

AFSCOASO does not know the extent of use of outside information utilities by the major air commands.

11. To what degree are programs and files shared among different users?

The sharing of programs and files is encouraged. A Software Exchange Facility is available through the use of DIAL-A-LOG.

12. What problems have you encountered or do you foresee with regard to limitation on multiple uses of proprietary s/w? Is your agency attempting to deal with this contractually?

Licenses are obtained for proprietary software. Volume discounts are obtained whenever possible. AFSCOASO would like to see the establishment of an Air Force-wide license for multiple copy discounts of proprietary software. The AFSCOASO is working an RFP to accomplish this.

13. What levels of growth do you foresee over the next five years with respect to numbers of users and types of users and numbers and types of equipment for your organization?

Question not addressed.

C. People, Political, and Other Considerations

1. What provisions have you made with regard to staffing and training to facilitate the introduction, acceptance, and use of micros?

The training of users on microcomputers should be addressed relative to the cost of the microcomputer system itself. Training classes, conferences, and a telephone hot-line, are provided by AFSCOASO and/or the major air commands. The use of vendor courses, university classes, manuals, and on-the-job training is encouraged.

AFSCOASO has developed an on-line system (DIAL-A-LOG).

DIAL-A-LOG is available via the ARPAnet and provides users a software exchange, research index, user groups, news, etc..

2. What unique personnel problems do you foresee with the infusion of microcomputers?

The main problem is the inability to hire and keep qualified personnel. The career path for the technical person in the military should be reexamined.

3. What unique political/organizational problems do you foresee with the growing availability and use of micros?

Question not addressed.

4. Do you anticipate any major changes in the physical work environment due to a major introduction of micros?

This cannot be addressed by the AFSCOASO, but should be a concern of each Air Command and installation.

5. Who has been the most agressive in the introduction of micros - ADP or the user community?

Factions of the ADP community have been the most aggressive. The microcomputer is a tool provided by the ADP community that enables the end user to more readily accomplish his job. It is encumbent upon the ADP community to provide tools such as these.

6. How have the issues related to micros differed for ADP and the user community?

The role of the ADP community has changed. AFSCOASO and the ADP groups within an Air Command must be customer oriented and provide the user with required services. With the advent of the micro, the user community will be assuming more and more of the application programming effort.

D. Other Contacts/ References

1. Have any sources of information/expertise been particularly valuable? If yes, which ones?

Journals, magazines, local computer stores, vendors, local universities, and other microcomputer users are valuable sources of information.

House of Representatives, House Information Systems

Conversation with Dave Gaydos

House Information Systems (HIS) Computer Center Division is responsible for the planning, development, procurement and management of new technology ADP and communications equipment and software within the House of Representatives.

A. Policy, Management, and Administration

1. Does your agency distinguish among micros, minis, and large general purpose computers? If so, how?

There is a distinction made between microcomputers, minicomputers, and large general purpose computers. Price is a major distinguishing feature.

2. Who (person, position, organization) has overall responsibility for micros?

The Director's Office has overall responsibility for ADP systems, including microcomputers. However, microcomputer systems (within the Congressional offices) have been set up independantly of HIS.

3. What policies (implicit and explicit), regulations, directives are operative with regard to micros?

The regulations governing microcomputers are only now beginning to evolve. The need to establish a microcomputer policy increases as the number, variety, and usage of microcomputer systems increase. Standards are being established.

4. Does the degree of control exercised over micros reflect a considered approach or one that's just evolved?

There is some control at this time.

5. Are micros treated differently than other comparably priced resources (e.g., lab equipment)?

The environment is almost totally business/administrative and lab equipment is not procured. All microcomputers are treated similarly to other comparatively priced ADP equipment.

6. To what extent are the sequence and pace with which applications are introduced, controlled by higher level management?

Higher level management is becoming more involved. The members of the House of Representative have similar needs (correspondence, value-added capabilities, etc.), many of which can be handled by micrcomputer systems. HIS's microcomputer efforts to meet these needs are being increased.

B. Current environment/experience

1. What generic hardware and software are currently available and supported by microcomputers?

Generic applications include the business/administrative software packages, MSDOS and DEC-compatible hardware and software. Hardware includes several Cromemco, Apple, IBM PC, and NorthStar microcomputers.

2. What telecommunications facilities are used to interconnect the micros and what type of interconnections are made?

Telecommunications facilities are being developed. A MitreNet based, broadband local area network (LAN) is being installed in most offices and buildings. The necessary links will be provided to connect any Congressman's system to the LAN.

3. What is the degree to which systems h/w and s/w are compatible/ transportable and can "talk" with one another?

Question not addressed.

4. To what degree is use of off-the-shelf vs. specially developed systems and software encouraged?

Off-the-self systems and software packages are highly encouraged.

5. What has been the method by which you have identified and evaluated microcomputer h/w and s/w? What have been the specific features that you have looked for in specific application programs?

Information has been exchanged with other Federal Agency microcomputer users. The use of both CP/M and MSDOS systems and software is encouraged because of the large number of software packages currently available. DEC microcomputer systems are

considered as extensions of current DEC minicomputers currently in use.

6. What application packages are being used including utilities and DBMS's?

   Application packages include: WORDSTAR, SELECTOR V, LOTUS 1-2-3, VISICALC, CONDOR, and dBASE II.

7. To what degree are development, procurement, support and maintenance centralized?

   Microcomputer development, procurement, support, and maintenance will be centralized within HIS, however, each Congressman can develop and procure his/her own system. The HIS staff support the House members and will be overseeing these services.

8. What is the adequacy of vendor provided maintenance and support?

   Question not addressed.

9. What microcomputer operating system and languages are used/preferred?

   Language preferences include CP/M, MSDOS, DEC compatible systems, and BASIC.

10. Are outside (videotex) information utilities accessed? Which ones? Extent of Use?

    The information utility, Dialcom and JURIS are used by the Congressional offices.

11. To what degree are programs and files shared among different users?

    Question not addressed.

12. What problems have you encountered or do you foresee with regard to limitation on multiple uses of proprietary s/w? Is your agency attempting to deal with this contractually?

    Licenses are obtained for proprietary software. Volume discounts will be negotiated and obtained whenever possible.

13. What levels of growth do you foresee over the next five years with respect to numbers of users and types of users and numbers and types of equipment for your organization?

Growith within the House should be consistent with industry projections. Micros will certainly improve the way Congressional district offices do their will work.

C. People, Political, and Other Considerations

1. What provisions have you made with regard to staffing and training to facilitate the introduction, acceptance, and use of micros?

The users of ADP equipment in the House are served by the HIS staff. They will provide training, manuals, and support to microcomputer users.

2. What unique personnel problems do you foresee with the infusion of microcomputers?

Though it may not be a problem, providing information and coaching specialists in the information center environment, must be addressed.

3. What unique political/organizational problems do you foresee with the growing availability and use of micros?

HIS has little control over the types of microcomputer hardware and software being purchased by and for the offices of the individual congressmen. HIS will need to provide consumer clearinghouse type services.

4. Do you anticipate any major changes in the physical work environment due to a major introduction of micros?

There is the possibility of more staff work being done in Congressional district offices.

5. Who has been the most agressive in the introduction of micros - ADP or the user community?

Both have been aggressive with the user community a little more so.

6. How have the issues related to micros differed for ADP and the user community?

The user community views microcomputers as a tool to help automate the office work; the ADP staff is concerned with the connectivity and compatibility of the microcomputers and networks.

D. Other Contacts/ References

1. Have any sources of information/expertise been particularly valuable? If yes, which ones?

A lot of work has been done with the Congressional Budget Office.

Department of Labor

Interview with Mr. Thomas Byrne, Director of the Office of Policy and Review.

The Department of Labor (DOL) consists of several semi-autonomous organizations. The Office of Policy and Review within DOL headquarters has oversight responsibility for Data Processing.

A. Policy, Management, and Administration

1. Does your agency distinguish among micros, minis, and large general purpose computers? If so, how?

The Department of Labor does not distinguish between microcomputers, minicomputers. except in terms of cost. There is no real technological differentiation between the various types of systems. The Department no longer purchases large general purpose computers. Instead, ADP services are obtained on a contract basis from the private sector.

2. Who (person, position, organization) has overall responsibility for micros?

The Oversight and Review group within the Office of Administrative Management (OAM) has overall responsibility for microcomputers.

3. What policies (implicit and explicit), regulations, directives are operative with regard to micros?

Currently, there are no explicit policies regarding microcomputers. A draft guideline ("Automated Information Systems Standards") has been completed, but is not yet in effect. The emphasis of this document is on compatibility and convertibility. DOL does not want to inhibit the infusion of new technology.

Implicitly, floppy disks and single function systems such as word processors are being discouraged.

4. Does the degree of control exercised over micros reflect a considered approach or one that's just evolved?

DOL does not differentiate between the various types of ADP equipment, and therefore exercises minimal control over the acuisition of this type of equipment. Concern is with controlling applications and/or systems and not with controlling the use of microcomputer technology. Projects are controlled and reviewed, not equipment.

5. Are micros treated differently than other comparably priced resources (e.g., lab equipment)?

Microcomputers are ADP devices and are treated in the same manner as other ADP equipments.

6. To what extent are the sequence and pace with which applications are introduced, controlled by higher level management?

The missions (applications) within DOL are generated by high level management and changing legislation. Thus, there are few clearcut applications which can be defined and planned for in advance. With the exception of the Bureau of Labor Statistics (BLS), the agencies which comprise DOL rarely have the luxury of advance planning of applications and microcomputer use.

B. Current environment/experience

1. What generic hardware and software are currently available and supported by microcomputer.

There is currently a request for proposal (RFP) to procure 30 systems. These systems will handle word processing, data entry, remote job entry (RJE), and be interactive and batch systems. Systems will be multifunctional and use hard disks (not floppy disks).

2. What telecommunications facilities are used to interconnect the micros and what type of interconnections are made?

DOL is currently running their own network. They are planning to release an RFP to procure a Value Added Network.

3. What is the degree to which systems h/w and s/w are compatible/ transportable and can "talk" with one another?

There is presently no acceptable way to insure systems compatibility/transportability without creating a chilling effect on the acquisition of such systems. An acceptable standard is being developed.

4. To what degree is use of off-the-shelf vs. specially developed systems and software encouraged?

The use of off-the-shelf systems and software is encouraged.

5. What has been the method by which you have identified and evaluated microcomputer h/w and s/w? What have been the specific features that you have looked for in specific application programs?

The concern is with the functional capabilities of the system.

6. What application packages are being used including utilities and DBMS's?

Several DBMSs are used. The ability to link a DBMS from a non-host system to a host system is a problem that must be addressed.

7. To what degree are development, procurement, support and maintenance centralized?

All development, procurement (under $50,000), support, and maintenance are decentralized and are the responsibility of the agencies within DOL. Purchases over $50,000 must go through this office (Office of Policy and Review).

8. What is the adequacy of vendor provided maintenance and support?

Not a concern of this office. Maintenance and support is delegated to the agency level.

9. What microcomputer operating system and languages are used/preferred?

Operating systems used/preferred include: UNIX, P-System, CP/M, and MS-DOS. Languages include BASIC, Pascal, C, ALGOL, COBOL, FORTRAN, and FORTH.

10. Are outside (videotex) information utilities accessed? Which ones? Extent of Use?

No outside utilities are being referenced as there is no particular need to do so.

11. To what degree are programs and files shared among different users?

Some program and file sharing occurs within agencies projects. Programs and files are not shared between agencies since there is very little commonality between agency projects.

12. What problems have you encountered or do you foresee with regard to limitation on multiple uses of proprietary s/w? Is your agency attempting to deal with this contractually?

No problems are forseen. It is believed that any licensing problems that may arise will be taken care of by industry.

13. What levels of growth do you foresee over the next five years with respect to numbers of users and types of users and numbers and types of equipment for your organization?

The numbers of terminal devices DOL will grow into the thousands over the next five years.

C. People, Political, and Other Considerations

1. What provisions have you made with regard to staffing and training to facilitate the introduction, acceptance, and use of micros?

Our Directorate of Personnel Management is currently developing a comprehensive program to train staff and management in the use of our soon to be installed computer systems.

2. What unique personnel problems do you foresee with the infusion of microcomputers?

Microcomputers have caused the jobs of traditional ADP personnel to change. It is necessary to reorient these personnel to the new technology.

3. What unique political/organizational problems do you foresee with the growing availability and use of micros?

The growing availability and use of micrcomputers will create a greater demand for data processing and an increased awareness of its capabilities. As the use of microcomputers by higher level management increases, the demand for aquiring systems, software, and support will also increase.

4. Do you anticipate any major changes in the physical work environment due to a major introduction of micros?

The physical work environment will need to be modified to accomodate both personnel and equipment.

5. Who has been the most agressive in the introduction of micros - ADP or the user community?

The ADP community has been most aggressive. The ADP managers are relatively young, offer no resistance to incorporating new technology, and have encouraged the acquisition of "user oriented" microcomputer systems.

6. How have the issues related to micros differed for ADP and the user community?

The issues related to microcomputers have not differed inasmuch as our ADP personnel provide program support and are 'servers' of the program areas.

D. Other Contacts/ References

1. Have any sources of information/expertise been particularly valuable? If yes, which ones?

Question not addressed.

Navy Data Automation Command and
Navy Regional Data Automation Command

Interview with Robert Green at the Navy Data Automation Command (NAVDAC) and John Severin of the Micro/Mini Evaluation Team at the Navy Regional Data Automation Command (NARDAC) at Norfolk, Va.

NAVDAC is responsible for the support of non-tactical ADP resources in the Navy. It consists of seven regional commands, NARDACs. NARDAC-Norfolk has been tasked with providing a centralized group to evaluate and support microcomputers within the Navy. The Micro/Mini Evaluation Team is that group.

A. Policy, Management, and Administration

1. Does your agency distinguish among micros, minis, and large general purpose computers? If so, how?

There is no distinction made between micrcomputers, minicomputers and large general purpose computers, except in terms of cost. Systems over $3000 are procured from different funds.

2. Who (person, position, organization) has overall responsibility for micros?

The NAVDAC-Pentagon has overall ADP responsibility. NAVDAC-Norfolk provides overall support (evaluations and recommendations) for microcomputers to the other NAVDAC commands.

3. What policies (implicit and explicit), regulations, directives are operative with regard to micros?

NAVDAC has developed a packet of information documents on microcomputers. These documents do not establish policy or directives, but are intended as guidance documents and to show current NAVDAC plans for microcomputer support.

The microcomputer defacto standards are encouraged (CP/M, Z80, S-100 bus, 8" floppy). Navy Commands are encouraged to use the defacto standards, if NAVDAC support is desired.

4. Does the degree of control exercised over micros reflect a considered approach or one that's just evolved?

The degree of control has evolved and has resulted in the establishment of the Micro/Mini Evaluation Team, at NARDAC-Norfolk. The amount of control is subtle, hardware or software not recommended by the Evaluation Team, will not be supported. Therefore, it is to the benefit of the Navy Commands to use recommended hardware and software.

5. Are micros treated differently than other comparably priced resources (e.g., lab equipment)?

Microcomputers are treated in the same manner as other ADP devices.

6. To what extent are the sequence and pace with which applications are introduced, controlled by higher level management?

Question not addressed.

B. Current environment/experience

1. What generic hardware and software are currently available and supported by microcomputers?

Generic applications range from: word processing, electronic spreadsheet, data entry, DBMS, correspondence control, work forcasting, to applications specific to the functional needs of the Navy.

Hardware includes various equipments. The following minimum levels are recommended:

one Z-80 processor (4MHZ)
64K bytes of RAM
one terminal with a 24 line x 80 character display
one 8" floppy disk drive, soft sectored

2. What telecommunications facilities are used to interconnect the micros and what type of interconnections are made?

Microcomputers are not connected at this time. The development and use of a local area network (LAN) is being explored.

3. What is the degree to which systems h/w and s/w are compatible/ transportable and can "talk" with one another?

One of the most significant advantages of CP/M and a primary concern of the Navy, is software transportability. The use of CP/M compatible software and 8" soft sectored floppy disk drives has enabled software to be taken from machine to machine or vendor to vendor.

4. To what degree is use of off-the-shelf vs. specially developed systems and software encouraged?

Off-the-shelf software packages are highly encouraged; however customization of software packages is done. Some in-house software for specialized functional requirements such as shipyard functions is developed and programmed.

5. What has been the method by which you have identified and evaluated microcomputer h/w and s/w? What have been the specific features that you have looked for in specific application programs?

The Evaluation Team has identified and evaluated hardware and software thru hands-on testing of manufacturer's products. The documentation and users manuals are compared with the actual implementations of the systems. Human factor aspects (user friendliness, ergonomics) are also evaluated.

6. What application packages are being used including utilities and DBMS's?

CP/M compatible software is suggested. Applications packages currently being recommended include: word processors: WORDSTAR with SPELLSTAR, SPELLGUARD, WORDSEARCH; spreadsheets: CALCSTAR, SUPERCALC, T/MAKER II; PEARL SERIES program generator; application generators: SELECTOR IV, DBASE II, MDBS III; and DATASTAR data entry.

7. To what degree are development, procurement, support and maintenance centralized?

Support through evaluations and recommendations is centralized. Procurement, development, and maintenance are not. The ADP group within each NARDAC is responsible for the procurement, development, limited support, and maintenance of microcomputers. It is recommended that maintenance be included with the microcomputer procurement or arranged on a per call basis.

A tri-service (Navy, Army, Air Force) procurement agreement for microcomputer hardware and software is being developed.

8. What is the adequacy of vendor provided maintenance and support?

Question not addressed.

9. What microcomputer operating system and languages are used/preferred?

The CP/M operating system is used and encouraged. The languages include: Pascal, COBOL FORTRAN, PL/1, and BASIC.

10. Are outside (videotex) information utilities accessed? Which ones? Extent of Use?

The Evaluation Team does not know the extent of use of outside information utilites by the Navy Commands.

11. To what degree are programs and files shared among different users?

Question not addressed.

12. What problems have you encountered or do you foresee with regard to limitation on multiple uses of proprietary s/w? Is your agency attempting to deal with this contractually?

Licenses are obtained for proprietary software. Volume discounts are obtained whenever possible. The Evaluation Team has been able to obtain hardware and software on loan from vendors.

13. What levels of growth do you foresee over the next five years with respect to numbers of users and types of users and numbers and types of equipment for your organization?

Question not addressed.

C. People, Political, and Other Considerations

1. What provisions have you made with regard to staffing and training to facilitate the introduction, acceptance, and use of micros?

NAVDAC periodically sponsers a conference on micrcomputers for Naval personnel. A training and demonstration center is available at NARDAC-Norfolk. The center has several microcomputer systems with which users may experiment. Software sharing, bulletin boards, user groups, telephone hot-line, and microcomputer workshops have also been developed to help facilitate the introduction and use of microcomputers.

2. What unique personnel problems do you foresee with the infusion of microcomputers?

It is necessary to train and advise Navy customers on how to implement microcomputers and when to use a microcomputer rather than a mini- or mainframe computer.

3. What unique political/organizational problems do you foresee with the growing availability and use of micros?

Question not adressed.

4. Do you anticipate any major changes in the physical work environment due to a major introduction of micros?

This is not a concern of the Evaulation Team, but rather a concern of each of the Navy Commands.

5. Who has been the most agressive in the introduction of micros - ADP or the user community?

The Evaluation Team is very agressive in the promotion of microcomputers.

6. How have the issues related to micros differed for ADP and the user community?

Question not addressed.

D. Other Contacts/ References

1. Have any sources of information/expertise been particularly valuable? If yes, which ones?

Journals, magazines, local computer stores, and vendors have been valuable sources of information.

National Oceanic and Atmospheric Administration

Interview with Francis Balint, Director of the Office of Information and Management Services (OIMS) and his staff.

The National Oceanic and Atmospheric Administration (NOAA) consists of several semi-autonomous orgarizations. OIMS administers policy and guidance to these organizations.

A. Policy, Management, and Administration

1. Does your agency distinguish among micros, minis, and large general purpose computers? If so, how?

All types of microcomputers are treated as any other ADP equipment. It is not clear as to what constitutes a micro, mini, or mainframe computer.

2. Who (person, position, organization) has overall responsibility for micros?

OIMS acts as ADP staff experts for NOAA. All adminstrative and programmatic aspects of computers are handled by OIMS. Purchase orders for microcomputers are reviewed; OIMS is interested in who, what, why of the purchase order, not in controlling or stopping the purchase of microcomputers.

3. What policies (implicit and explicit), regulations, directives are operative with regard to micros?

ADP equipment must be justified and purchased under the appropriate procurement regulations. OIMS has established an Information System Guideline, which provides broad and non-restrictive guidance.

It is NOAA policy to encourage and facilitate the development of networks of computer systems. All microcomputers, word processors, and other ADP equipment must be able to communicate. NOAA organizations are directed to coordinate all requirements with IMS4. IMS4 is a centralized software support center for the management and acquisition of microcompter software among NOAA elements. IMS2 has responsibility to review computer program acquisition requests for computer equipment and/or services.

4. Does the degree of control exercised over micros reflect a considered approach or one that's just evolved?

The degree of control appears to be an evolving one. OIMS offers support on an incentive basis - if a user chooses to disregard the Guidelines, OIMS will not offer support. A survey to identify the types of microcomputers systems that have been

purchased was conducted and an inventory established on a Micromation microcomputer using the Cromemco DBMS.

5. Are micros treated differently than other comparably priced resources (e.g., lab equipment)?

Microcomputers are treated in the same manner as other ADP devices or resources of comparable cost. Similar review procedures are followed in either case.

6. To what extent are the sequence and pace with which applications are introduced, controlled by higher level management?

Higher level management established the "sequence" with appropriate directives and guidance (that includes procedures) documentation. But the management makes no attempt to interfere with the user set pace.

B. Current environment/experience

1. What generic hardware and software are currently available and supported by microcomputers.

Generic applications include: line editor, data entry, report writer, word processing, electronic spreadsheet, and telecommunications.

Hardware is not specified by brand name, but generic recommendations (from the Information Systems Guideline) include:

8 or 16 bit microprocssor;
IEEE standard S-100 bus (if applicable);
memory "width" of 1 byte or 1 word;
memory size of 64K bytes minimum;
DMA transfers;
I/O ports for console, printer, and modem;
console display of 24 lines of 80 characters, 5x7 dot matrix or better, 96 ASCII characters displayable, full 128 ASCII character keyboard, cursor addressing, and RS232C I/O interface.

2. What telecommunications facilities are used to interconnect the micros and what type of interconnections are made?

Telecommunications facilities are discussed in the Information System Guidelines. All microcomputers that wish to communicate do so using ASCII, Asynchronous and the 3780 protocol that is IBM Binary Synchronous. CLINK is also used for

interfacing the micromation microcomputers with the UNIVAC main frame facility.

3. What is the degree to which systems h/w and s/w are compatible/ transportable and can "talk" with one another?

NOAA has standardized on the CP/M operating system software for microcomputers and for word processors. Common hardware is not required, but the hardware obtained must meet the operating system requirements and accommodate the telecommunications compatible protocols. As to transportability of software, it is occasionally necessary to tailor a CP/M compatible applications software package to given hardware, because of the particular control codes built into the hardware. System hardware and software are compatible but not transportable. It is NOAA policy to assure communications compatibility among and between microcomputers, word processors, and other ADP equipment. There are many unique applications that are not transportable and don't need to be.

4. To what degree is use of off-the-shelf vs. specially developed systems and software encouraged?

The use of off-the-shelf software is encouraged. However, OIMS does customize and debug the software if it is determined to be cost effective.

5. What has been the method by which you have identified and evaluated microcomputer h/w and s/w? What have been the specific features that you have looked for in specific application programs?

All hardware and software is evlauated against the guidelines established in the Information System Guidelines document. For application programs, OIMS tries to make certain that they are debugged, well documented, and user friendly.

6. What application packages are being used including utilities and DBMS's?

NOAA currently supports Cromemco DBMS with DBR and Micro Data Base Systems, Inc. CODASYL DBMS with networking MDBS III.

Application packages include: line editors, ED and EDIT; a data entry package and report writer, DATASTAR; word processing, WORDSTAR with MAIL-MERGE and SPELLSTAR; electronic spreadsheet, CALCSTAR; and telecommunications, CLINK.

7. To what degree are development, procurement, support and maintenance centralized?

Each organization within NOAA develops, procures and maintains its own microcomputer systems.

There is no centralized acquisition office at NOAA. However, OIMS will help users initiate procurement procedures. A feasibility study to define the requirements and applications for the microcomputer must be undertaken prior to acquiring a system. This study is reviewed by OIMS. In addition, a checklist for evaluating microcomputers was developed. A centralized purchasing agreement with vendors and volume discounts are being negotiated.

Support for hardware and software listed in the Information System Guidelines is offered.

8. What is the adequacy of vendor provided maintenance and support?

Vendor provided maintenance and support are more than adequate. An increasing number of vendors as well as third party organizations are providing maintenance and support.

9. What microcomputer operating system and languages are used/preferred?

The suggested operating system should be compatible with CP/M version 3.0 or above and satisfy FIPS PUBS 1 and 7. The preferred languages are ALGOL, BASIC, C, COBOL, FORTH, FORTRAN, Pascal, and PL/1.

10. Are outside (videotex) information utilities accessed? Which ones? Extent of Use?

Several outside information utilites are accessed. Agreements to use information utilites operated by the Department of Defense and several universities have been set up. All utilites are accessed through dial-up capabilities.

11. To what degree are programs and files shared among different users?

The sharing of files among users is in the development stage. The standardization of programs throughout NOAA organizations will facilitate the compatibility of software. The sharing of programs and files has evolved because of efficiency, rather than economic reasons.

12. What problems have you encountered or do you foresee with regard to limitation on multiple uses of proprietary s/w? Is your agency attempting to deal with this contractually?

No problems are foreseen. The original license is purchased at the vendor established price. Succeeding copies are purchased at discounted prices when available.

13. What levels of growth do you foresee over the next five years with respect to numbers of users and types of users and numbers and types of equipment for your organization?

NOAA has experienced a 5-7% average annual growth in communication costs over the past 10 years. This increase was not due to cost increases but an increase in usage. With this as a qualifier, OIMS feels that the number and use of microcomputers will increase at least that much.

C. People, Political, and Other Considerations

1. What provisions have you made with regard to staffing and training to facilitate the introduction, acceptance, and use of micros?

A training and demonstration center is being developed. The center will have several microcomputer systems available for users to experiment with. An annual symposium is conducted to familiarize NOAA staff with current microcomputer technology.

2. What unique personnel problems do you foresee with the infusion of microcomputers?

No major personnel problems are anticipated. As with any ADP system, a problem might arise if a person with specific expertise leaves the organization.

3. What unique political/organizational problems do you foresee with the growing availability and use of micros?

A blurring of management lines might occur. For example, the inherent appeal of microcomputers might prompt higher level managers to request access to data or to perform tasks that are typically the reponsibility of lower levels of management.

4. Do you anticipate any major changes in the physical work environment due to a major introduction of micros?

No major changes are forseen.

5. Who has been the most agressive in the introduction of micros - ADP or the user community?

The user community

6. How have the issues related to micros differed for ADP and the user community?

No clear distinction is made between micrcomputers, minicomputers and main frame computers; therefore, the issures that arise concerning microcomputers are really little different than those concerning mini's and main frames, i.e., quantity quality of requirements, functional needs, kind of applications intended, population to be served, cost effectiveness of serving the requirements of many users from a single capability or allowing many users to each have a single capability.

D. Other Contacts/ References

1. Have any sources of information/expertise been particularly valuable? If yes, which ones?

OIMS has found that seminars and symposiums provided by Datapro and other educational organizations have been very helpful. Microcomputer technology has been changing so rapidly, it is important to continually obtain up to date information. Microcomputer (and computer) related periodicals have also been valuable sources of information.

State of New York

Interview with Frank Giannetti, manager of Marketing and Research, an office within the Office of General Services

The Office of General Sevices (OGS) for the State of New York, is concerned with the ADP equipment needs for all state agencies and universities. The Marketing and Research office is responsible for all matters pertaining to microcomputers.

A. Policy, Management, and Administration

1. Does your agency distinguish among micros, minis, and large general purpose computers? If so, how?

Yes, There is a distinction between microcomputers and other ADP equipment. The procurement and support for microcomputers is different than that for mini- and general purpose computers.

2. Who (person, position, organization) has overall responsibility for micros?

The Manager of Marketing and Research has overall responsibility for microcomputers.

3. What policies (implicit and explicit), regulations, directives are operative with regard to micros?

The Marketing and Research office procures all microcomputers for the State. State agencies and universities lease the microcomputers from this office. As a general rule, no agency can purchase a microcomputer, but exceptions are made.

4. Does the degree of control exercised over micros reflect a considered approach or one that's just evolved?

Considered approach. OGS, in particular the Marketing and Research office, has control over microcomputers for the State.

5. Are micros treated differently than other comparably priced resources (e.g., lab equipment)?

There is no difference between microcomputers and other comparably priced resources with respect to standards and purchasing.

6. To what extent are the sequence and pace with which applications are introduced, controlled by higher level management?

The sequence and pace is controlled by the individual agencies. Each agency controls the application and authorization of its microcomputer usage.

B. Current environment/experience

1. What generic hardware and software are currently available and supported by microcomputers?

OGS does not get intimately involved with the applications of the state agencies. Word processors with mail and spelling capabilities, electronic spreadsheet, and DBMS packages have been purchased.
Multivendor hardware to support educational applications, 5 Ī/4" and 8" disk, and multiuser systems are available.

2. What telecommunications facilities are used to interconnect the micros and what type of interconnections are made?

Specific telecommunication facilities for the agencies is not known. As the need to interconnect evolves, the marketing and research staff will evaluate and assist in developing appropriate facilities.

3. What is the degree to which systems h/w and s/w are compatible/ transportable and can "talk" with one another?

The 8", single density floppy disks can be interchanged between systems.

4. To what degree is use of off-the-shelf vs. specially developed systems and software encouraged?

Off-the-shelf software packages are highly encouraged.

5. What has been the method by which you have identified and evaluated microcomputer h/w and s/w? What have been the specific features that you have looked for in specific application programs?

Hardware and software are selected from the multivendor contracts and associated products list. A request for proposal (RFP) is being developed for the procurement of CP/M software packages. The members of the Marketing and Research staff

(microcomputer unit) determine the RFP specifications.

Agency users submit a Needs Assessment form to the Marketing and Research staff, who identify, evaluate, and recommend hardware and software products. Information about the user, his needs, and microcomputer system are maintained, in order to continue to support the user.

6. What application packages are being used including utilities and DBMS's?

No specific packages were mentioned. (See B1).

7. To what degree are development, procurement, support and maintenance centralized?

Procurement, support and maintenance for the State of New York is centralized and handled by OSG (Procurement office or the Marketing and Research office). Maintenance is included as part of the vendor contract and handled by OSG.

The requirement and authorization for the procurement of microcomputers is at an agency level. Approval at the Agency level must be obtained to lease a microcomputer from OSG. State agencies cannot buy microcomputers directly from vendors.

8. What is the adequacy of vendor provided maintenance and support?

Vendor support and maintenance has not been sufficently tested yet. Thus far, vendors have been cooperative and have responded quickly.

9. What microcomputer operating system and languages are used/preferred?

CP/M and MP/M are the preferred operating systems.

10. Are outside (videotex) information utilities accessed? Which ones? Extent of Use?

The use of outside information utilities is not known. It is dependant on the agency's application requirements and is not coordinated through this office.

11. To what degree are programs and files shared among different users?

The amount of program and file sharing is not known. It is not a concern of this office, but depedant on the agency and its applications.

12. What problems have you encountered or do you foresee with regard to limitation on multiple uses of proprietary s/w? Is your agency attempting to deal with this contractually?

All proprietary software is licensed. OSG has no control over the duplication of software by the user. But, support will only be provided to the individual who has purchased the package (serial numbers are checked in order to identify a 'legal' owner).

13. What levels of growth do you foresee over the next five years with respect to numbers of users and types of users and numbers and types of equipment for your organization?

Question not addressed.

C. People, Political, and Other Considerations

1. What provisions have you made with regard to staffing and training to facilitate the introduction, acceptance, and use of micros?

To facilitate the introduction and use of microcomputers, the Marketing and Research office participates in business shows. Vendors are invited to show and discuss their products. A demonstration center has been established to demonstrate hardware and software, and provide users an opportunity to try out the various hardware and software packages.

The Marketing and Research staff is available to answer users' questions, and provide advice and training. Additional activities include: a problem log with solutions, telephone hotline, a newsletter, a user group, and formal visits to agency user sites.

2. What unique personnel problems do you foresee with the infusion of microcomputers?

The staff must include people to market, 'hack', and answer questions related to microcomputers in order to support users needs.

3. What unique political/organizational problems do you foresee with the growing availability and use of micros?

Not really able to answer this question, but microcomputers (with its support and staff) must compete with that of traditional ADP systems.

4. Do you anticipate any major changes in the physical work environment due to a major introduction of micros?

   This is not a concern of this office, but of the user's agency.

5. Who has been the most agressive in the introduction of micros - ADP or the user community?

   The ADP community and state university users have been the most agressive in the introduction of microcomputers. The Marketing and Research staff have been actively marketing and demonstrating the capabilities of microcomputers.

6. How have the issues related to micros differed for ADP and the user community?

   Question not addressed.

D. Other Contacts/ References

1. Have any sources of information/expertise been particularly valuable? If yes, which ones?

   Vendors, computer stores, and Microcomputer (business) shows have been excellent sources.

Smithsonian Institution

Interview with Mr. Reginald Creighton, Senior Systems Analyst, Office of Information Resource Management.

The Office of Information Resource Management (OIRM) is responsible for the management of ADP equipment within the Smithsonian Institute.

A. Policy, Management, and Administration

1. Does your agency distinguish among micros, minis, and large general purpose computers? If so, how?

Yes, The Agency does make a distinction between microcomputers, minicomputers and large general purpose computers. Micrcomputers are funded by research projects which may benefit from automated procedures.

2. Who (person, position, organization) has overall responsibility for micros?

The specifications for microcomputer purchases are reviewed by the OIRM.

3. What policies (implicit and explicit), regulations, directives are operative with regard to micros?

At this time, there are no directives policies regarding microcomputers. The microcomputer defacto standards are encouraged (CP/M, Z80, S-100 bus, 8" floppy disk).

4. Does the degree of control exercised over micros reflect a considered approach or one that's just evolved?

Considered approach, although control over microcomputers is limited.

5. Are micros treated differently than other comparably priced resources (e.g., lab equipment)?

Question not addressed.

6. To what extent are the sequence and pace with which applications are introduced, controlled by higher level management?

The sequence and pace is controlled by the individual scientist or researcher.

B. Current environment/experience

1. What generic hardware and software are currently available and supported by microcomputers?

Generic applications include: word processing, text editing, data entry, file management, bibliographies, and manuscript preparation.

The hardware consists of several different microcomputer systems: Dynabyte, Industrial microcomputer system, California computer systems, Compupro, Teletek/Rodix, Osbournes, plus several SYM-1 computers used for laboratory automation. Each microcomputer system has two floppy disks.

2. What telecommunications facilities are used to interconnect the micros and what type of interconnections are made?

Software packages, such as Modem 7, enable the microcomputers to communicate with the mainframe computer via the telephone lines. Communication between microcomputers is accomplished with the exchange of floppy disks. A local area network (LAN) called SINET interlinks many of the microcomputers.

3. What is the degree to which systems h/w and s/w are compatible/ transportable and can "talk" with one another?

High degree of compatible and transportable hardware and software has been achieved due to the use of defacto standards.

4. To what degree is use of off-the-shelf vs. specially developed systems and software encouraged?

The use of off-the-self systems and software is highly encouraged.

5. What has been the method by which you have identified and evaluated microcomputer h/w and s/w? What have been the specific features that you have looked for in specific application programs?

As hardware and software are identified, a feature analysis is performed.

6. What application packages are being used including utilities and DBMS's?

Software packages being used support the applications above (B1) and include: WORDSTAR, FMS80, dBASEII, and REMOTE80 or Modem 7.

7. To what degree are development, procurement, support and maintenance centralized?

Procurement and support of microcomputers is centralized. The OIRM has overall responsibility for these functions. Maintenance is part of the procurement contract.

8. What is the adequacy of vendor provided maintenance and support?

Vendor support and maintenance seem adequate.

9. What microcomputer operating system and languages are used/preferred?

The preferred operating system and language are CP/M and BASIC.

10. Are outside (videotex) information utilities accessed? Which ones? Extent of Use?

No outside information utilities are being accessed.

11. To what degree are programs and files shared among different users?

Programs are shared among users, but files are not.

12. What problems have you encountered or do you foresee with regard to limitation on multiple uses of proprietary s/w? Is your agency attempting to deal with this contractually?

A license is obtained for all proprietary software.

13. What levels of growth do you foresee over the next five years with respect to numbers of users and types of users and numbers and types of equipment for your organization?

A sizeable growth in microcomputer procurement and use is anticipated.

C. People, Political, and Other Considerations

1. What provisions have you made with regard to staffing and training to facilitate the introduction, acceptance, and use of micros?

The OIRM provides written procedures and assistance to microcomputer users. Training is provided as part of the microcomputer's procurement contract.

2. What unique personnel problems do you foresee with the infusion of microcomputers?

An increased training requirement is foreseen.

3. What unique political/organizational problems do you foresee with the growing availability and use of micros?

Question not addressed.

4. Do you anticipate any major changes in the physical work environment due to a major introduction of micros?

Question not addressed.

5. Who has been the most agressive in the introduction of micros - ADP or the user community?

The user community has been most agressive.

6. How have the issues related to micros differed for ADP and the user community?

The user community views the microcomputer as a tool in accomplishing its job. The ADP community is concerned with the procurement, support, maintenance, etc. of these tools.

D. Other Contacts/ References

1. Have any sources of information/expertise been particularly valuable? If yes, which ones?

Question not addressed.

Walter Reed Army Institute of Research

Interview with LTC Rodney Edge, Director of the Division of Biometrics (DOB) at the Walter Reed Army Institute of Research.

The Walter Reed Army Institute of Research (WRAIR) is part of the U.S. Army Medical Research and Development Command. The DOB is concerned with establishing and managing the policy and procedures for ADP acquitition and use within the WRAIR.

A. Policy, Management, and Administration

1. Does your agency distinguish among micros, minis, and large general purpose computers? If so, how?

No distinction is made between microcomputers, minicomputers, and large general purpose computers. We must obtain approval from higher headquarters before purchasing any computer.

2. Who (person, position, organization) has overall responsibility for micros?

The Division of Biometrics (DOB) has overall responsibility for computers and data processing within WRAIR.

3. What policies (implicit and explicit), regulations, directives are operative with regard to micros?

Microcomputers must be justified and purchased in accordance with appropriate Army procurement regulations. The level of justification required (for microcomputers) is not as extensive as for other more costly ADP equipment.

The Advance System Working Group has been established to develop quidance, policy, and documentation for microcomputers within WRAIR. To encourage the use and to familiarize new users with the microcomputer systems, game playing is allowed during off-duty hours.

4. Does the degree of control exercised over micros reflect a considered approach or one that's just evolved?

Evolved approach. DOB is constantly upgrading its plans for microcomputers. A recently completed five year plan has been updated to include the future goals for microcomputers.

5. Are micros treated differently than other comparably priced resources (e.g., lab equipment)?

Yes, different Army regulations apply to microcomputers than other comparably priced resources. The programmability and functionality differences make microcomputers unique.

6. To what extent are the sequence and pace with which applications are introduced, controlled by higher level management?

There is little control from higher level management concerning the sequence and pace with which applaictions are introduced. DOB would like to install more microcomputers, but due to its limited staff cannot cope with a faster paced implementation schedule.

B. Current environment/experience

1. What generic hardware and software are currently available and supported by microcomputers?

Generic applications range from word processing, electronic spread sheets, data entry, editing, verification, tabulation, and a record keeping system; to medical research applications such as game playing to determine stimulus response time for the neurologically impaired.

Hardware includes approximately $150,000 worth of Apple computers and related equipment (printers, plotters, etc.), and several TRS-80s, as well as a half dozen other brands.

2. What telecommunications facilities are used to interconnect the micros and what type of interconnections are made?

All microcomputers must use asynchronous communications protocol. A DEC VAX 11/780 is used as a file server to interconnect and communicate between microcomputers. One dial-out modem and 20 dial-in modems are available. Telecommunication software is provided with the ACCESS III terminal program for Apple computers and LCOMM for TRS-80s. The TRS-80s run the LDOS operating system.

3. What is the degree to which systems h/w and s/w are compatible/ transportable and can "talk" with one another?

All microcomputers, terminals, and word processors are compatible and can talk with each other through the VAX.

4. To what degree is use of off-the-shelf vs. specially developed systems and software encouraged?

The use of off-the-self packages are encouraged. Software packages are developed (in-house) to meet specialized application requirements.

5. What has been the method by which you have identified and evaluated microcomputer h/w and s/w? What have been the specific features that you have looked for in specific application programs?

Hardware and software are evaluated with respect to the application's requirements, environment, and their compatibility with existing systems.

6. What application packages are being used including utilities and DBMS's?

Application packages include: VisiCalc, Apple Writer, Apple Access, Script, Business Graphics, PFS for Apple, PFS Report,PFS Profile Data Saver, PIK, and Mail List Manager. Packages being obtained include: Word juggler, Record Processing Services (RPS), Quick File, Transfer, Wordstar, Context MBA, Screen Director, Data Manager, Data Base, Data Reporter, and DBase II

7. To what degree are development, procurement, support and maintenance centralized?

All microcomputer procurement is centralized through this office. Maintenance contracts for the Apple computers and other machines are coordinated through the command at Fort Dietrick. Although a maintenance contract exists, it is sometimes necessary to repair equipment in-house, e.g. it is not always possible to have a maintenance contract on every piece of equipment.

8. What is the adequacy of vendor provided maintenance and support?

WRAIR has a maintenance contract for its microcomputers. The level of vendor support has been good. Acquiring a maintenance contract at the time of equipment purchase is recommended.

9. What microcomputer operating system and languages are used/preferred?

Microcomputer languages include: BASIC, FORTRAN, Pascal, and COBOL. Programming is sometimes done in assembly language (due to speed requirements).

10. Are outside (videotex) information utilities accessed? Which ones? Extent of Use?

There is very little use of outside information utilities.

11. To what degree are programs and files shared among different users?

Files are shared openly among users.

12. What problems have you encountered or do you foresee with regard to limitation on multiple uses of proprietary s/w? Is your agency attempting to deal with this contractually?

WRAIR is concerned that proprietary software is handled correctly. We buy the software we use, e.g., we do not knowingly use illegally copied software.

13. What levels of growth do you foresee over the next five years with respect to numbers of users and types of users and numbers and types of equipment for your organization?

The use of microcomputers will continue to increase and eventually, there will probably be one in every laboratory.

C. People, Political, and Other Considerations

1. What provisions have you made with regard to staffing and training to facilitate the introduction, acceptance, and use of micros?

Microcomputer classes are provided periodically and are incorporated into physician training programs. Game playing is encouraged to familiarize users with the microcomputers. Staff members are available to answer questions.

2. What unique personnel problems do you foresee with the infusion of microcomputers?

The main problem is hiring and keeping qualified personnel. The pay/grade structure hinders WRAIR from offering a competitive salary to experienced personnel.

3. What unique political/organizational problems do you foresee with the growing availability and use of micros?

There is great potential to make mistakes due to the popularity, ease of justification, and the rapidly changing technology.

4. Do you anticipate any major changes in the physical work environment due to a major introduction of micros?

   Yes. Changes in office space, lab layout, and the use of communication lines are anticipated.

5. Who has been the most agressive in the introduction of micros - ADP or the user community?

   Both the users and ADP management have been equally agressive.

6. How have the issues related to micros differed for ADP and the user community?

   The users want a tool to do the job, whereas, ADP personnel are concerned with cost, standards, and maintenance of microcomputers.

D. Other Contacts/ References

1. Have any sources of information/expertise been particularly valuable? If yes, which ones?

   Journals, magazines, local computer stores, and local universities are valuable sources of information.

NBS-114A (REV. 2-8C)

U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET (See instructions)	1. PUBLICATION OR REPORT NO. NBS SP 500-102	2. Performing Organ. Report No.	3. Publication Date June 1983

4. TITLE AND SUBTITLE

Computer Science and Technology
Microcomputers: A Review of Federal Agency Experiences

5. AUTHOR(S)

Dennis Gilbert, Elizabeth Parker, Lynne Rosenthal

6. PERFORMING ORGANIZATION (If joint or other than NBS, see instructions)

NATIONAL BUREAU OF STANDARDS
DEPARTMENT OF COMMERCE
WASHINGTON, D.C. 20234

7. Contract/Grant No.

8. Type of Report & Period Covered

Final

9. SPONSORING ORGANIZATION NAME AND COMPLETE ADDRESS (Street, City, State, ZIP)

Same

10. SUPPLEMENTARY NOTES

Library of Congress Catalog Card Number:83-600545

☐ Document describes a computer program; SF-185, FIPS Software Summary, is attached.

11. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here)

This document presents the results of a recent study which reviewed Federal agency experience with microcomputers during the period of August 1982 - January 1983. Its intended audience are all those who are interested in microcomputer-based technology and want to benefit from the current Federal experience. Interviews conducted with the Federal agencies are presented in detail, summarized, and tabulated. Related management and technical issues are identified and discussed. The study found that many Federal users are eagerly looking for guidance in selecting and using microcomputer systems. Incentive based support to end users appears to be a major tool available to agencies for managing the new technology. Emphasis is being placed on off-the-shelf software packages. Appendices of this document provide the reader with an initial road map to sources of information.

12. KEY WORDS (Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons)

Federal agency microcomputer experience; microcomputer experience; microcomputer management issues; microcomputer technical considerations.

13. AVAILABILITY

☒ Unlimited
☐ For Official Distribution. Do Not Release to NTIS
☒ Order From Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
☐ Order From National Technical Information Service (NTIS), Springfield, VA. 22161

14. NO. OF PRINTED PAGES

146

15. Price

USCOMM-DC 6043-P80

NBS TECHNICAL PUBLICATIONS

PERIODICALS

JOURNAL OF RESEARCH—The Journal of Research of the National Bureau of Standards reports NBS research and development in those disciplines of the physical and engineering sciences in which the Bureau is active. These include physics, chemistry, engineering, mathematics, and computer sciences. Papers cover a broad range of subjects, with major emphasis on measurement methodology and the basic technology underlying standardization. Also included from time to time are survey articles on topics closely related to the Bureau's technical and scientific programs. As a special service to subscribers each issue contains complete citations to all recent Bureau publications in both NBS and non-NBS media. Issued six times a year. Annual subscription: domestic $18; foreign $22.50. Single copy, $5.50 domestic; $6.90 foreign.

NONPERIODICALS

Monographs—Major contributions to the technical literature on various subjects related to the Bureau's scientific and technical activities.

Handbooks—Recommended codes of engineering and industrial practice (including safety codes) developed in cooperation with interested industries, professional organizations, and regulatory bodies.

Special Publications—Include proceedings of conferences sponsored by NBS, NBS annual reports, and other special publications appropriate to this grouping such as wall charts, pocket cards, and bibliographies.

Applied Mathematics Series—Mathematical tables, manuals, and studies of special interest to physicists, engineers, chemists, biologists, mathematicians, computer programmers, and others engaged in scientific and technical work.

National Standard Reference Data Series—Provides quantitative data on the physical and chemical properties of materials, compiled from the world's literature and critically evaluated. Developed under a worldwide program coordinated by NBS under the authority of the National Standard Data Act (Public Law 90-396).

NOTE: The principal publication outlet for the foregoing data is the Journal of Physical and Chemical Reference Data (JPCRD) published quarterly for NBS by the American Chemical Society (ACS) and the American Institute of Physics (AIP). Subscriptions, reprints, and supplements available from ACS, 1155 Sixteenth St., NW, Washington, DC 20056.

Building Science Series—Disseminates technical information developed at the Bureau on building materials, components, systems, and whole structures. The series presents research results, test methods, and performance criteria related to the structural and environmental functions and the durability and safety characteristics of building elements and systems.

Technical Notes—Studies or reports which are complete in themselves but restrictive in their treatment of a subject. Analogous to monographs but not so comprehensive in scope or definitive in treatment of the subject area. Often serve as a vehicle for final reports of work performed at NBS under the sponsorship of other government agencies.

Voluntary Product Standards—Developed under procedures published by the Department of Commerce in Part 10, Title 15, of the Code of Federal Regulations. The standards establish nationally recognized requirements for products, and provide all concerned interests with a basis for common understanding of the characteristics of the products. NBS administers this program as a supplement to the activities of the private sector standardizing organizations.

Consumer Information Series—Practical information, based on NBS research and experience, covering areas of interest to the consumer. Easily understandable language and illustrations provide useful background knowledge for shopping in today's technological marketplace.

Order the **above** *NBS publications from: Superintendent of Documents, Government Printing Office, Washington, DC 20402.*

Order the **following** *NBS publications—FIPS and NBSIR's—from the National Technical Information Service, Springfield, VA 22161.*

Federal Information Processing Standards Publications (FIPS PUB)—Publications in this series collectively constitute the Federal Information Processing Standards Register. The Register serves as the official source of information in the Federal Government regarding standards issued by NBS pursuant to the Federal Property and Administrative Services Act of 1949 as amended, Public Law 89-306 (79 Stat. 1127), and as implemented by Executive Order 11717 (38 FR 12315, dated May 11, 1973) and Part 6 of Title 15 CFR (Code of Federal Regulations).

NBS Interagency Reports (NBSIR)—A special series of interim or final reports on work performed by NBS for outside sponsors (both government and non-government). In general, initial distribution is handled by the sponsor; public distribution is by the National Technical Information Service, Springfield, VA 22161, in paper copy or microfiche form.